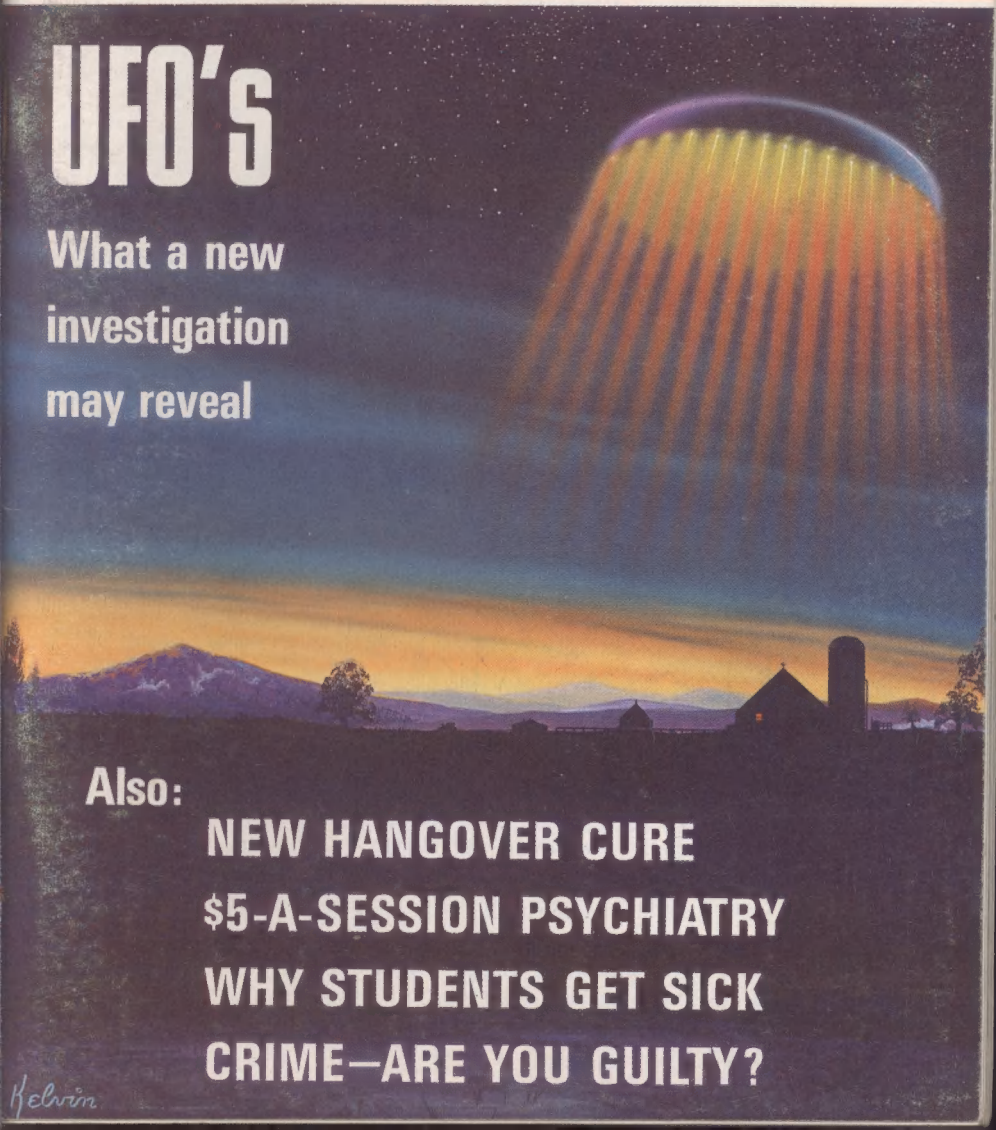
The science news monthly

SCIENCE DIGEST

DECEMBER 1966 50 CENTS ICD



UFO's

What a new investigation may reveal

Also:

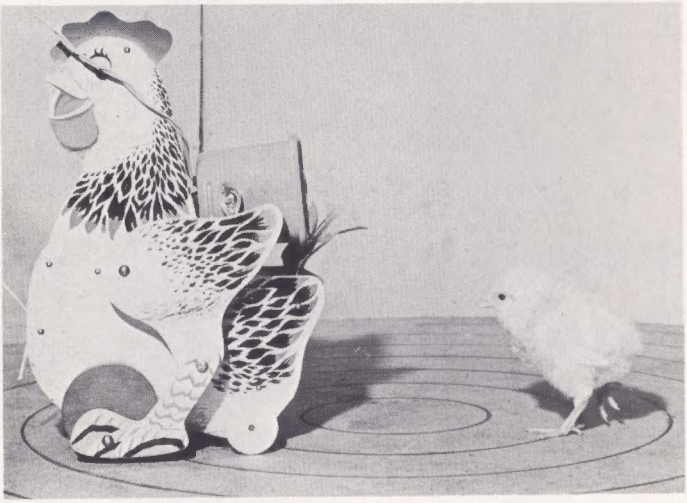
NEW HANGOVER CURE

$5-A-SESSION PSYCHIATRY

WHY STUDENTS GET SICK

CRIME—ARE YOU GUILTY?

Kelvin



Hello, Mother

THE newly hatched chick above, following after a wooden toy, is not just confused. It was conditioned to follow while still in the egg. The key to the test is not the wooden toy but the small speaker mounted on its back which emits a continuous "beep-beep" sound. It is all part of a test of prenatal auditory imprinting conducted at Northern Illinois U. in DeKalb, Ill. In the experiment, two groups of ordinary White Rock eggs were incubated. The experimental group received a continuous auditory signal from the twelfth to the seventeenth day of incubation. The control group was exposed only to ordinary incubator noises.

Immediately after breaking free of the shell, the young chicks were placed in the center of a circular table which had two speakers mounted on the edge. Movement of the chicks from the center toward the speaker emitting the sound was measured by concentric circles painted on the table. Chicks in the group exposed to the "beep-beep" sound went to the source of the sound. Those in the control group showed no preference for any sound and responded equally well to all noises. To check this idea, one of the sound-emitting horns was attached to a toy hen. Experimenters moved the toy along and found that when the sound was turned on, the chicks readily followed their aural mother.

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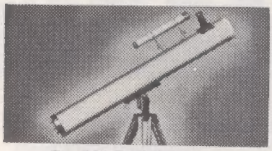

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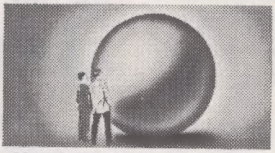

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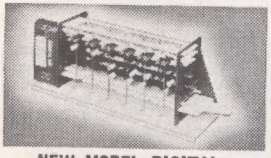

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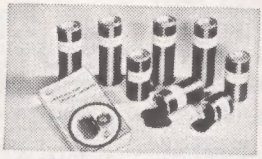

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WARNING: Don't look for *Science Digest* in its old colors next month. With the beginning of our 31st year, the first issue of 1967 will come to you in livelier, brighter, more modern garb.

The anniversary means that this issue of *Science Digest* rounds out 30 years of publishing—through much of the Depression, World War II and the headlong postwar years that have really been more *war* than *post*, yet have produced a surge toward human betterment.

THIS MONTH

The first issue of *Science Digest* made its bow at a time of great journalistic births. Our magazine got its start within days of the first issue of *Look* and just a few months after the first *Life*.

To survive at all has been a major achievement for many magazines during the intervening years.

Our stock in trade, science, is not exactly calculated to set men's hearts aflame. So nobody's surprised that we haven't followed *Life* and *Look* into the multi-million-circulation ionosphere.

But we may yet. A second generation has grown up since we first appeared and a third is well along. They know science is knowledge and knowledge is life itself today, a better life than ever before. Our plan for the future is to spread the word and help bring that better life about. —THE EDITORS

The science news monthly

SCIENCE

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DIGEST

After twenty years, the investigation of UFO's has taken a dramatic new turn. The Air Force has commissioned a university to study the phenomena. For a look at what the scientists may find, see page 54.

Painting by George V. Kelvin

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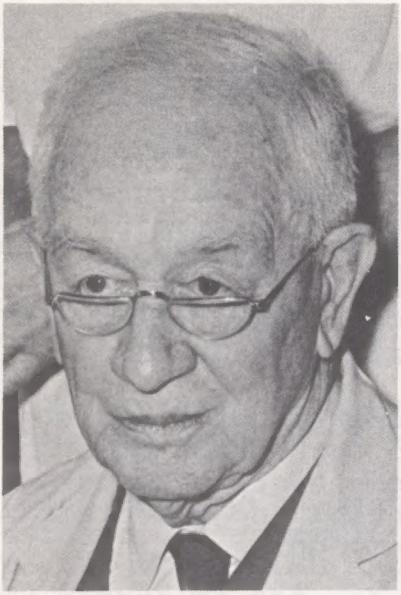
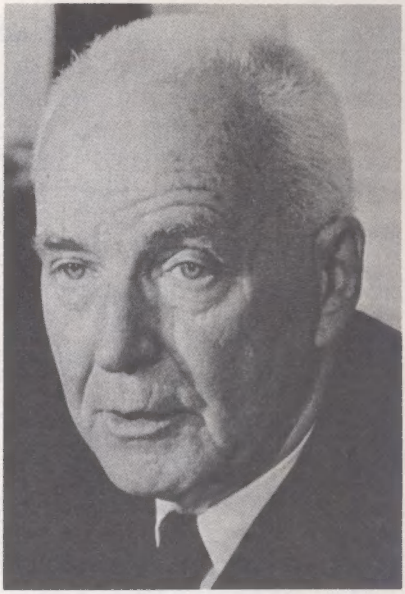
THE LATE SCIENCE NEWS

X-RAY SOURCE. Astronomers have located a visible object at a spot in the sky from which extremely strong X-rays have been detected. The object is blue and star-like. Some think it's a gas cloud condensing into a new star, a stellar system surrounded by a gas cloud or an entirely new kind of celestial phenomenon. The finding is important because in recent years astronomers have located some two dozen X-ray sources, and it is expected that hundreds will eventually be found. Many may resemble the newly located object.

ELECTRICITY IN TORNADOES. A possible answer to the puzzle of how so much energy can be concentrated in the vortex of a tornado has been suggested by Dr. Bernard Vonnegut. His theory is based on a study of a photograph, and eyewitness reports, of two vertical pillars of light that appeared in connection with a tornado in Ohio in 1965. It is still not known whether the electricity starts the tornado or whether the tornado gets under way and generates the powerful charge of electricity that keeps it going for a long time.

EARTH'S WAGGING 'TAIL'. Pioneer 7, an artificial satellite of the sun, has indicated that the earth has a long, wagging magnetic tail, and that the solar wind may break off huge chunks of the tail and fling them into space. Pioneer detected the tail 3.2 million miles out.





Photos: UPI

CANCER EXPERTS WIN NOBEL PRIZE. Two American cancer researchers shared the 1966 Nobel Prize for medicine. Dr. Francis Rous (left) of Rockefeller University is considered "the grand old man" of cancer research. In 1911 he discovered that cancer could be produced by a virus. At 87, he is one of the oldest men to receive the prize. Dr. Charles B. Higgins (right) of the U. of Chicago is considered the father of modern cancer chemotherapy. He pioneered the use of hormones in treating prostatic cancer.

OTHER PRIZES. The Enrico Fermi award for contributions to the study of nuclear energy went to Prof. Otto Hahn and his colleague Prof. Fritz Strassmann and to Prof. Lise Meitner. . . .Dutch astronomer Dr. Jan H. Oort won the $25,000 Vetlesen Prize for contributions to understanding the earth.

SPACE COLLISION? Space is now cluttered with satellites, yet the chances of two orbiting spacecraft colliding are said to be one million to one--against. But it happened. Or did it? First, space experts reported that two naval communications satellites collided, but were unharmed by the meeting. Later the collision statement was modified. The Navy said its information showed only that the two satellites "occupied the same space at the same time."

SURVEYOR 2 CRASH. A rocket motor failure caused Surveyor 2 to go out of control halfway to the moon. Scientists were unable to reestablish control and the craft probably crashed on the moon.

JAPANESE FAILURE. Japan's first attempt to join the space race ended in failure when a 27-pound, 18-inch, instrument-carrying satellite failed to achieve orbit.

SOVIET SPACE PROBLEMS. A prolonged lull in Soviet manned space flights has led some experts to believe the Russian program is in "real trouble." One of Russia's leading space scientists recently noted that a number of "difficult problems" must still be investigated and solved before a moon trip can be attempted. Prof. Leonid I. Sedov disavowed reports that the Soviet Union would have a man on the moon in 1969.

ACCELERATED U.S. SCHEDULE. Optimistic U.S. planners hope to put an American on the moon by the end of 1968, a year ahead of the announced deadline. However, no public revision of the timetable will be made.

NOISE PERIL. Two researchers have strongly warned that the noise levels to which Americans are subject are causing significant damage to hearing. Said Dr. John D. Daugherty of the Harvard School of Public Health: The average person should now "seriously consider reducing the amount of time he spends each day in a noisy environment." The noise peril in industry has long been known, but Dr. Daugherty warns in an article written with Dr. Oliver I. Welsh: "What has passed unnoticed is that many noise levels in the community exceed those found in industry."

LSD DAMAGE. UCLA psychiatrists reported evidence is accumulating rapidly that repeated use of LSD causes long-term organic damage to the brain. The conclusion was based on clinical observation and animal experiments which showed that a small dose caused changes in the brain structure.

AUTOMATED INSULIN. Scientists at Rockefeller University in New York have developed an automatic method for synthesizing insulin. The technique is not yet fully perfected, but when it is the scientists predict that artificial insulin can be produced in days, rather than months.

WHO CAN'T DRINK MILK. A Maryland study showed that adult Negroes were often unable to tolerate milk. Researchers noted that recent research in Central Africa discovered a deficiency of the enzyme needed for proper digestion of milk. Milk drinking after infancy is rare in Africa because it is hard to raise dairy cattle.

EAST WEST EXCHANGE. The U.S. and Soviets have begun a daily exchange of weather satellite photos and data. The exchange has been described as "the most extensive technological cooperation between the two countries since the end of World War II."

CHI-CHI RETURNS. Another attempt at East-West cooperation was less successfu. Chi-Chi, Britain's unromantic giant panda, was returned to the London Zoo. Chi-Chi had spent months in Moscow in the hope that she could be induced to mate with Russia's panda An-An (see "Chi-Chi Goes to Moscow," June '66). The romance never got off the ground, but zoo officials may try again. This time An-An will be sent to London.

HOPE FOR ATLANTIS. A Greek-American expedition searching for Atlantis has come up with "shreds of evidence which. . .point toward a confirmation of the theory that the lost continent should be identified with the Minoan empire which ruled the Aegean archipelago and Crete." The search for more clues will continue next year.

MUSHROOMS TO MEAT. A chemist for a meat packing company has developed a process for turning mushrooms into an inexpensive "meat extender." Dr. Arthur Karler said that mushrooms were able to grow on waste products and could be converted into a food that had a meat protein content as high as meat itself. Dr. Karler believes that large-scale application of the method could help solve the world's growing food shortage, and that the product could be made acceptable to the American housewife.

—1—

THE SPACE PICTURE

NASA

Edward H. White, command pilot Virgil (Gus) Grissom and Roger B. Chaffee will be the first manned Apollo crew in program designed to land a man on the moon.

And now, Apollo

FIFTEEN years ago, people would hoot at the impossible idea of landing a man on the moon. Today, the Apollo program to do just that is under way.

With the preliminary programs, Mercury and Gemini, successfully completed, the U.S. space team is prepared to tackle landing on our nearest neighbor "within this decade."

Landing may come as early as the 24th Apollo flight, perhaps in 1969. By then, it's thought, we'll have worked out methods reliable enough to get a crew to the moon and safely home.

Already, two of the 27 planned Apollo flights have checked out the heat shield in sub-orbital flights and one, the performance of liquid oxygen while weightless.

The first manned Apollo flight may be the fourth shot, slated for this month. If all systems are "go," Lieut. Col. Edward H. White II, Virgil I. Grissom of the Air Force and Lieut. Roger B. Chaffee of the Navy will live aloft in an earth orbit mission of 14 days.

Early Apollo flights will pave the way to the ultimate lunar landing.

NASA

All systems proved "spaceworthy" on 3 unmanned Apollo command module flights.

At countdown on that flight, a Saturn V will lift the 365-foot spacecraft into the sky. The five F-1 engines will develop 7,500,000 pounds of thrust, each engine slurping up 1,000 gallons per second of liquid oxygen and kerosene to get the 3,000-ton apparatus off the ground. The first stage will burn 2,100 tons of fuel in less than three minutes. The payload will be lofted 30 miles up, then the S-1C first stage will drop away. For 70 miles of travel, the S-2 will take over, burning out after six and a half minutes. During this time, the 34-foot escape system for launch emergencies will be jettisoned.

The third thrust stage, S-4B, will put the Apollo into an earth orbit at 17,500 miles per hour. It cuts out when the three-module Apollo is parked in orbit.

A little later, when computers at the Manned Spacecraft Center (MSC) calculate the lunar launch window is open, the S-4B will reignite and push the capsule into a 25,000-mph flight headed for the moon.

During the 70-hour journey, the three astronauts will live in the command module, the principal part of the Apollo vehicle. Compared to the Mercury and Gemini cabins, the Apollo is roomy; it does let the astronauts recline. However, the three will still be cooped up in an area smaller than a compact car. The module measures 13 feet wide at the bottom and stands about 11 feet high. It is shaped like a brimming Big Dipper without the handle.

The astronauts will be in touch with the earth by radio and TV. They will realign the Apollo compartments while en route to the moon. Initially, the Apollo will consist of command module (CM), service module, lunar excursion module (LEM), adapter, instrument unit for launch systems guidance and the S-4B power stage. After the maneuvers, the nose of the CM will be hooked to the LEM, encased in its adapter.

Then the three-part Apollo craft will jettison the S-4B and its instrument panel. Any course corrections necessary can be made with the service module's 22,000-pound thrust rocket engine.

About 64 hours after leaving earth, the astronauts will flip the craft about face. The service mod-

ule power can then slow the craft to 3,600 mph. The moon's gravity will tug stronger and stronger. The Apollo will swing into a lunar orbit some 83 miles high. Two astronauts will crawl into the LEM. It will uncouple from the mother ship at about three mph. Then the two astronauts will use coasting and powered descent for a moon touchdown.

One at a time, the men will exit from the LEM. Each will be heavily clad in space suits with accordion joints, an undergarment interwoven with water-circulating tubes to carry away body heat, a thermal protector and a meteoroid cape to fend off micrometeoroid dust. Strapped to each one's back will be a backpack, including a four-hour oxygen supply, two-way radio, heat-dumping radiator and a radiation gauge.

Once on the moon, an astronaut will stay out for as much as three hours at a time. Strict weight and volume restrictions will limit the moon souvenirs collected. Each will scoop up bits of lunar surface and package it in sealed containers of about 10 centimeters each. Astronauts will try not to contaminate the soil chemically with LEM fuel or leakage from their space suits. They will photograph mountains and perhaps the "full earth," 80 times as bright as the full moon.

The astronauts will also try to plant sensors on the moon to transmit lunar geophysical information for at least a year. Their 170-pound ALSEP (Apollo lunar surface experiments package) will be able to detect natural seismic waves, measure the direction and intensity of the moon's magnetic field, measure the flux of high-energy positive ions and lunar heat flow.

After four to 34 hours on the moon, the two will return to the LEM. The lower stage of the LEM will act as a launching pad. The upper part will rise 83 miles to rendezvous and dock with the mother ship. The moon explorers will crawl back into the main module, towing their 80 pounds of moon with them. The LEM will be jettisoned and, with a lunar escape velocity of 5,460 mph, the Apollo team will start back. It will break free of the moon's gravity some 29,000 miles from it.

Final course corrections will be made when the spacecraft is travelling at 24,600 mph. Then the powered service module will be tossed away. Only the command module with the three astronauts will reenter the earth's atmosphere, 60 hours later.

Re-entry for the Apollo will be trickier than for Mercury and Gemini. The air-friction heat will be 5,000° F. If the capsule makes too shallow an approach, it might miss the earth completely. If the approach is too steep, the CM will plunge directly into the atmosphere and burn up like a meteor. The bottom heat shield will protect the crew until parachute deployment and landing are okay. From launch to touchdown, the trip will take about eight days.

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THE SPACE PICTURE

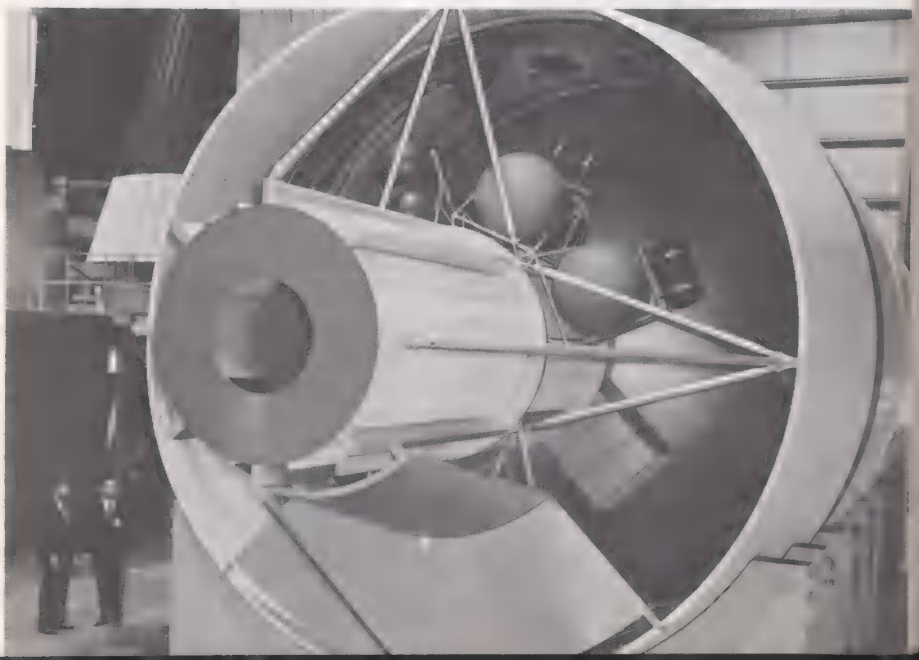
How to land on Mars

Right: Crewmen make last-minute checks on a parachute payload before flight test. High-altitude NASA experiments will simulate the thin planetary atmosphere of Mars and examine designs and shapes of various payloads as they travel through thin atmospheres to land on solid surfaces. Bar at top holds ballast and instrument controls for launch balloon. Cameras and tape recorders in the payload record data during descent and landing.

Below: Twelve rocket engines power disc-shaped flight unit to land parachute and payload on Mars. The flight unit will be carried up 24½ miles by balloon, then the solid-propellant rockets will thrust the unit in an arched trajectory. The parachute, on top, will part with the flight unit and float the instrument payload to the ground. The project is part of proposed Voyager instrument exploration of the planets which starts in 1973.

Manned orbiting laboratory

The first U.S. manned orbiting laboratory may be simply the spent second stage of a Saturn rocket. Really nothing more than an empty fuel tank, the spent stage could be used as an MOL by means of an airlock, which is now being designed by McDonnell Aircraft in collaboration with NASA's Marshall Space Flight Center. Above, engineer moves through airlock mockup. Below, airlock gives access to 29-foot-long laboratory.



$5-a-session psychiatry

Health insurance plans, Government, labor and industry programs, and clinics are making psychiatry more available.

by Flora Rheta Schreiber and Melvin Herman

"WE just can't afford psychiatry." Alexander Gralnick, M.D., psychiatrist of Port Chester, New York, says he hears that statement everywhere. "Yet, to seventy million Americans," he adds, "a certified psychiatrist is available at $5.00 a visit or less. The irony is that most of them don't know it."

The $5.00 psychiatrist has been made available through:

1. Health insurance
2. Government programs, such as Medicare.
3. Low-cost clinics, often based on ability to pay.
4. Industry and union health programs.

These programs provide the finest in psychiatric care to many employed and retired persons.

Take John Miles, a sales engineer, always affable, but who one day snapped at a demanding VIP and lost his best account, socked his own boss in the nose, then slammed out of the office.

Suddenly his mood shifted. He didn't go home but checked into the Presidential Suite of an expensive hotel and telephoned his wife. When she heard him talk wildly of his great expectations and a nonexistent new job, she phoned their family doctor, who offered to call a psychiatrist.

"We can't afford one," she blurted. She was wrong. When Mrs. Miles called John's boss, he was not only understanding but he did something more; he read the firm's health insurance policy. Luckily, the company was one of 114,210 businesses whose employees are covered by major medical insur-

Miss Schreiber is an award-winning writer on psychiatry; Herman, the Executive Secretary of the National Association of Private Psychiatric Hospitals.

ance. Not only did John have to pay only $5.00 of the $20.00 psychiatric fee, but the policy would pay three-quarters of $10,000 a year in psychiatric fees for two years.

Many major medical policies include a deductible feature. General Electric employees pay the first $50.00; IBM employees, the first $200.00.

The United Automobile Workers contract eliminates the requirement that the worker pay the first costs of his illness.

There are pros and cons on this question. On the one hand, it is particularly important in psychiatric illness that there be no blocks to prompt and proper care. An early visit to the doctor might turn the tide. On the other hand, careless use of medical care, because it is free, drives the costs sky high and the care may be held in small esteem unless it is paid for by the person seeking it. But Dr. Robert Kimmich, Commissioner of Mental Health for the state of Michigan, says hospitals such as the Psychiatric Institute of New York have given successful treatment without charge for many years.

"For one hundred years or more, treatment for mental illness in this country has been divided into treatment for the rich and treatment for the poor," says Dr. Robert Reiff, director of the division of psychology, Albert Einstein College of Medicine. Today, the gap is closing fast. The major automobile companies have enlarged their health programs to include psychiatric care. They now pay the first five visits fully and more than half the bills for many additional visits.

Hailing this program, Dr. Daniel Blain, 1964-5 president of the American Psychiatric Association, says: "It will for the first time make adequate care available to scores of millions of Americans who have been deprived of such care." He looks for this program to set the pattern for future plans.

There are other, even more-inclusive programs. The wife of a factory worker came home from the hospital with her first-born son, the fulfillment of her dreams. But day after day, her bewildered husband would find her sitting in her nightgown, her baby neglected, her house unkept. Finally, she became suicidal. She received treatment under the Kaiser-Permanente Health Plan, a group plan that covers all medical fees by engaging psychiatrists.

One psychiatric clinic, the Philadelphia Psychiatric Center, agreed to provide all psychiatric care for AFL-CIO members in the area. But only five percent of the expected union referrals came. To overcome fears of the hospital setting, the center today sends psychiatrists to the union, where they have made over 1,000 psychiatric evaluations.

Since President Kennedy asked for comprehensive psychiatric care for all Americans, 352 community mental health centers have sprung up throughout the country. Each provides some essential elements of

psychiatric care at fees ranging from $1.00 to $5.00.

Under the Medicare law, 19 million Americans, 65 and over, are eligible for free hospitalization, including psychiatric care for 60 days in each spell of illness. Under the voluntary plan costing $3.00 a month, 80 percent of limited psychiatric outpatient care is paid.

Referral centers, such as the one in Compton, California, work to stop expensive psychiatry before it begins. A young couple who had been married for eight years came to a center hurling abuses at each other. One searching interview with a social worker revealed their basic desire for a happy marriage and cut away the psychological barriers that kept them from working out their own problems. If they actually had needed psychiatric consultation or therapy, a referral would have been made.

Prevention of illness altogether or of further deterioration is the key to low costs. Tom Knapp, a young junior executive in a steel company, was brought into the office of the president and offered a well-deserved promotion. He turned it down flat. A month later, the president slyly included Tom's name in a list of the firm's executives slated for emotional check-ups at the Silver Hill Foundation in Connecticut. When he returned, Tom walked in and asked for the new job. He had worked out his fears. At the company's expense, a first-rate employee who might have become a problem was reclaimed.

Company mental health programs can often "reclaim" employees

Sometimes a psychiatrist acts on his own to keep costs down. Dr. Frank Kiesler of Grand Rapids, Minnesota, in order to get psychiatric care to the greatest number of people in a state with few psychiatrists, formed the Tri-County Mental Health Center and made himself psychiatric consultant to every family physician in the state north of Duluth. General practitioners, under his guidance, handle the emotional problems of their patients themselves.

One psychiatrist, whose contribution to low-cost care was immeasurable, met with a tragic death a few years ago. Dr. Halbert Leet of Foundation Hospital, Kentucky, for ten years flew his own plane over the mountains to hold one-day clinics in remote areas in several states. Often his fee was a slab of bacon or a brace of fowl. He was killed when his plane crashed while flying four reporters and photographers who were writing the story of his merciful rounds.

Another tragedy, two years ago, had a positive result. In New York, a desperate man asked for help at four hospitals, but there were no psychiatrists on emergency duty. He went home and committed suicide. Today, emergency walk-in psychiatric clinics, pioneered by Metropolitan, St. Vincent's and Mt. Sinai Hospitals, have psychiatrists

on duty 24 hours a day to treat anyone who comes in off the street, at no charge or at a very low fee.

The $5.00 psychiatrist is a reality. To make him available to more and more people, a series of conferences were held in the fall. At the first one, held in September, the men responsible for employee benefits in some of the largest companies in the country met to consider how their companies can better cover the costs of psychiatric care for their workers. They saw problems in the kind of coverage they were called on to give.

Dr. Walter Barton, medical director of the American Psychiatric Association, expressed the prevalent thought: "The same coverage is needed for the psychiatric patient as for all other medical patients."

World problem

"MENTAL illness remains a major world problem, despite recent advances," Mike Gorman, executive director of the National Committee Against Mental Illness, reminded an international audience at the Fourth World Congress of Psychiatry in Madrid.

"In America, we have drawn heavily upon European experience," he said. He pointed to a 15 percent reduction in the number of patients in our state hospitals over the past decade. But he added that "close to half a million people are still housed in these institutions and another half million are in general and private psychiatric hospitals."

He noted that America has "the dubious distinction of having some of the largest mental hospitals in the world—a number of them exceed 5,000 beds, and a few in the metropolitan areas are in the 10,-000-to-15,000-bed range."

Drug research hailed

He hailed the bold investigators in the field of drug research and the American pharmaceutical industry for fashioning a widespread network in the screening, evaluation and dissemination of drugs, and for launching a new era of psychochemotherapy.

Gorman stressed the contributions of aroused American citizens such as Dorothea Dix and Mrs. Albert D. Lasker in challenging the status quo in mental health care. Miss Dix engaged in a 30-year campaign against the incarceration of the mentally ill in jails and poorhouses. Mrs. Lasker embarked on a pilgrimage to Washington to convince the Congress to invest in medical research.

Gorman feels that the quality of care of the mentally ill is not solely the doctors' business and that an informed citizenry is vital. "Take the citizen of your countries into your confidence," he told his world audience. "Let them tour your hospitals and encourage them to speak to elected legislators and government officials in behalf of the cause. If you turn an educated citizenry loose, anything can happen and frequently does happen."

"Unlock the wards"

MENTAL hospital reforms in Great Britain are taking place on a national scale. This observation was made by Dr. A. R. May, Principal Medical Officer, Ministry of Health, London, in a talk at the 18th Mental Hospital Institute in Boston, in September.

In comparing psychiatric services today in England and Wales with those that existed 10 years ago, he noted that in 1956 in Great Britain, psychiatrists were concerned with the plight of the chronic patient and the dangers of institutionalization. Old ideas about custodial care of the patient were starting to give way to the appreciation of the value of active industrial rehabilitation and other resocialization measures.

Ten years ago, hospitals began to open their locked wards and eliminate other restrictions on patients' freedom. The concept of a therapeutic hospital community was developed. Certain wards were set aside for patients who could be admitted informally without any of the statutory requirements.

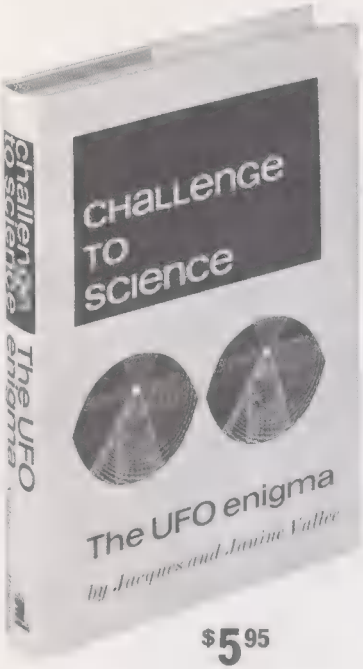
The Mental Health Act in 1959 did away with the judicial order for compulsory admission, except for court-committed cases, and made compulsory admission to mental hospitals dependent on medical recommendation alone. In most cases, the signature of two doctors is required, one of whom must be a physician with special experience in psychiatry. It also provided that, whenever practicable, mentally ill and mentally retarded patients be admitted to hospitals informally and on the same footing as other sick and disabled persons.

This drastically reduced the numbers of patients compulsorily detained in mental hospitals. In 1957, the total patient population in hospitals for mental illness and mental retardation numbered about 200,000, of which over 150,000 (or 75 percent were compulsorily detained under the Old Acts of Parliament. However, at the end of 1964, of a total of 193,000 patients in mental hospitals, those detained under the new act numbered 15,000 (or approximately 7½ percent).

Community care

Although it is difficult to obtain information about the proportion of patients kept in locked wards in England and Wales, the records of individual hospitals show that the number of such patients has been progressively reduced over the years. An inquiry by the Ministry of Health in 1962 indicated that although the proportion of these patients varied in different parts of Great Britain, nowhere did it exceed seven percent. A further survey taken three years later indicated that the proportion of locked-ward accommodations decreased to about two percent.

British care for the mentally ill has been closely paralleled in America. Both countries today are shifting the emphasis to community care.



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THE COLLEGE SCENE

Why students get sick

Health services on campus like this one at Berkeley treat wide range of ills.

Courtesy Medical World News

AMERICA'S college students will visit the campus health center an average of four times each during this academic year. And they will be diagnosed and treated, not only for the routine "childhood" ailments they managed to escape, but also for serious, hospitalizing infections and a growing assortment of exotic diseases brought back by students traveling overseas.

Today's college students often receive intensive treatment for infectious and contagious diseases, and even for serious mental troubles. But unmarried coeds discover that most health centers will not prescribe contraceptive pills. Moreover, the hospital beds at college health centers are no longer havens to escape examinations. Most colleges provide bedside exam service.

A survey of college health facilities by *Medical World News*, the weekly newsmagazine for doctors, turns up these and other interesting facts on the health care to be given an estimated 3½ million students this year by some 8,000 full-time and part-time campus doctors.

The report, "Medical Care on the Campus," calls the college doctor's practice a unique one. "The young men and women have outgrown the pediatrician. Yet they often re-

spond to infection as children do. Robust and resilient, they will bounce back quickly from a broken leg suffered while skiing but can be sidelined for weeks or even months with infection and contagion—mononucleosis and gastroenteritis."

Broader health service

College medicine today, the report continues, has outgrown the image of the college infirmary where fractures and sports injuries were given emergency treatment. Though these problems still command a great deal of attention, the survey finds that they are a small part of the physician's work load, particularly at larger colleges. Medical problems of athletes increasingly are being treated within the framework of the college health service, which can range up to complex medical center-type services offering surgery and a 120-bed hospital, such as that found at the University of California, Berkeley.

Increasingly, colleges are turning to environmental factors affecting the health and safety of students. At Harvard University, for example, a special screening team makes unannounced inspections of campus dining halls, laboratories, swimming pools, museums, drama centers, vending machines and college infirmaries. This team, armed with a Geiger counter, Petri dishes for culturing bacterial samples, slides and test tubes, hunts for sources of contamination which could cause outbreaks. These inspection tours at Harvard have cut in half the number of classroom days lost through accident and illness, the magazine observes.

College health centers are also slowly and steadily meeting the needs posed by increasing mental health problems of today's students. An estimated one in 10 students will need help this school year with emotional problems that interfere with college work. About two in every 1,000 students will have an actual psychotic breakdown.

[A study just reported by *Moderator* magazine estimates that suicides among U.S. college students in 1966 will total approximately 1,000.]

Increased mental help

The largest mental health departments are found at the Universities of California, Wisconsin and Minnesota and at M.I.T. and Harvard University, all of whom have more than one full-time psychiatrist. Some 15 other colleges have at least one full-time psychiatrist while more than 100 have mental hygiene programs with the services of a part-time psychiatrist. These services generally provide emergency treatment handing situations ranging from sexual problems to potential suicides. Patients needing more definitive treatment are usually referred to outside facilities.

For a report on the psychosomatic side of campus illnesses, see the article that follows.

College stress and illness

by Rebecca M. Osborn

MONONUCLEOSIS, the "kissing" disease, involves more than a kiss.

This infectious disease, a common health problem among today's college students, is linked to a depressed state of mind, according to Edith Schulhofer, LL.D., and Drs. Reuben S. Roy and Paul C. Trickett, researchers at Tulane University. The depression need not be severe—very few students develop psychoneurosis—but interviews with ill students have established the fact that it is present.

In a pilot study of twelve students who were diagnosed as having mononucleosis in the fall of 1965, all twelve were found to be "momentarily depressed" and "many admitted to being depression prone."

It was not a matter of chance that the study was carried out in the fall of the year. Mononucleosis hits hardest in October, reports Dr. John McMaster, director of student health at the University of Wisconsin and assistant professor of medicine at the Wisconsin Medical Center. Symptoms of this infectious disease vary among individuals. They include: sore throat, loss of appetite, lethargy, puffy eyelids, a skin rash, swollen lymph nodes in the neck, and a coating over the tonsils. Blood tests show an initial increase in the white blood cell count and atypical lymphocytes.

Mono, as it is called, accounts for almost 10 percent of student infirmary admissions at the University of Wisconsin and an additional 20 percent of student out-patients. About five of every 100 new students in U. S. colleges and universities will acquire mono this year. Most of them will be freshmen and sophomores. These facts are significant, for the immediate cause of the disease appears to be overwhelming stress—understandably more of a problem with entering students than with upperclassmen.

Many a young freshman will find that the A's that came so readily in high school are C's in college. Not only is college work more difficult than high school studies, but most of the student body are likely to be those who were at the top of their high school class. A student faced with a failing grade may incur mono as a way out of a humiliating situation. If he isn't prepared for a stiff examination or he knows that he will have to drop a course or change his curriculum, a medical diagnosis of mononucleosis gives him a legitimate excuse for his failure. And a way out—since mono usually lasts about two weeks and generally requires a period of six days in the college infirmary.

But this is *not* to say that students with mono are malingering or that they have courted the disease. After all, having mono doesn't solve

the student's problems or simplify his life in the long run. When researchers say that stress triggers mononucleosis they are only saying that the pressures on a student can cause him to become depressed and that in a depressed, anxious state he is more likely to contract this infection.

Congested living conditions contribute to the chance of getting mono, as evidenced by the fact that ill students are most often dorm students. No virus, however, has been isolated as the cause of the disease and it has never been successfully transmitted by researchers to animals or people. Short-term psychotherapy has been found helpful to its victims.

Surprisingly, the parents of students who contract mononucleosis are, most often, model parents who "controlled" the behavior of their children by love rather than by fear. Therapists at Tulane University found that victims of mono almost invariably described their parents as kind and loving. They were successful, accomplished people—often the mother as well as the father was a professional person. They had high ethical and social standards which they tended to establish in their children by example and explanation rather than by physical punishment or fear. Surely an admirable approach to raising children, but one that is hard for a young person to rebel against as he grows older.

In an emotional climate characterized by doubt and anxiety, nerves are taut. Tears are near the surface. Fears boil up from deep inside. The student, divided against himself, becomes less attentive. He cannot concentrate. His grades suffer and this increases his anxiety.

Psychiatrists do not see stress as something that can be eliminated from college life. Many college men and women do their best work under pressure. But it must not be overwhelming pressure and it must not be more than the individual himself can stand. The ability to withstand stress is a highly individual matter. Circumstances enter in, too. A poor grade on an English composition might not trouble a science major while it might seriously upset a potential English major planning to go into journalism. What could ordinarily be tolerated might be unbearable the day after a young woman had broken up with her steady date.

Anxiety, too, can bring on the unpleasant symptoms of an increase in blood pressure. It can also produce a condition known as hyperventilation—too much air taken into the lungs because of increased rate and depth of respiration. This condition has a very simple cure—breathing into a paper bag—but it can produce a feeling of suffocation and panic.

Gastro-intestinal symptoms are frequently related to emotional conflicts since both eating and elimination are the center of parental concern and direction from early childhood. It is significant that ulcerative colitis, for which no

causative agent has been found and which has been suspected of being related to nervous-factors, is one of the common health problems on campus.

Tendencies toward arthritis and urinary tract infections may be aggravated by anxiety. Among women students, acne and amenorrhea (failure to menstruate) are common psychosomatic ills. Irritating skin conditions, or dermatitis, can indicate an emotionally depressed state. With amenorrhea, a brief hormone treatment may be necessary to re-establish the normal cycle.

Interestingly, young people who are most aware of the appearance of their bodies and their physical features are likely to demonstrate external symptoms, dermatitis, for example, while those who are concerned about the internal organs are most likely to develop internal complications—ulcerative colitis, for example.

Short-term psychotherapy is frequently helpful when an anxiety-associated illness occurs. An hour-long session with a therapist or counselor once or twice a week for a few months may enable the student not only to overcome the symptoms of illness but to acquire understanding of the immediate cause of his anxiety and some degree of insight into the underlying conflict or personality problem. As a group, college men and women are above average in intelligence and usually show rapid improvement, especially as their grades go up.

$1 million for better chemistry

A $1 million effort to improve U.S. college chemistry courses —especially for the non-chemistry major—went into full operation at Stanford U. this fall.

The program to develop the "new chemistry" is being made by the Advisory Council on College Chemistry, under the chairmanship of L. Carroll King, professor of chemistry at Northwestern U. A three-year grant from the National Science Foundation is financing the effort.

"Most universities are already doing pretty well in training chemistry majors and the people who will make their careers in the field," says King. "The biggest problem is to devise a decent chemistry course for the students going into the arts, the humanities, journalism, education or the social sciences. Doing something about this situation will be the Council's top priority."

The survey course, usually offered the non-science major, "has never really worked," King adds.

"Its general shortcoming is that it teaches theory as fact, and the whole character of scientific knowledge and the means scientists use to solve problems have been neglected."

King says science is moving into the public sector and should be the concern of every man wanting a broad education.

Botany self-taught

SELF-teaching by listening to tape-recorded laboratory instructions, developed at Purdue U., has been adapted to teaching Botany 27 at Penn State U.

A three-credit course for nonmajors with a three-hour laboratory and two lectures, it was set up because increasing enrollments, together with limitations of time and facilities, made it mandatory to hold two simultaneous laboratories of 48 students each.

"This," says Prof. W. F. Westerfeld, "prevented me from personally explaining the work to the students." And he was unable to monitor the two talks given at the same time by assistants.

The self-teaching lab consists of 20 individual stations formed by covering standard table tops with plywood bases, each with two sets of double pegboard booths, back to back. Between the sets of booths are open work areas. Each station is equipped with basic laboratory tools.

"I record the master tape in my office," says Dr. Westerfeld. "The script is not a polished speech but more like extensive notes. When the student listens, he must not get the feeling that he is part of a large audience listening to a carefully prepared lecture; he must be under the illusion that the instructor is beside him."

An assistant is in attendance at all times. One can handle 20 students comfortably, because seldom will more than two or three be at a difficult sequence at the same time.

"As a matter of fact," says Dr. Westerfeld, "the students receive much more attention now than they did with the old system."

What do students think? They are "almost unanimously for it."

The other side of the coin

SCIENCE cannot ignore the humanities any more than the humanities can ignore science (see page 24).

That's the burden of a report released by a panel of engineers, industrialists and educators convened by the Engineers Joint Council.

"No longer," it says, "can the engineer remain a technical advisor to others in the application of science to human affairs."

What's needed, it says, is "a total reassessment of engineering education."

In discussing the humanities and the social sciences, the report emphasizes that these subjects are fundamental elements of professional education and not mere supplements: "An engineering curriculum should educate men in society —because an understanding of society is an indispensable essential attribute—a required qualification —of a professional engineer."

The report emphasizes that any reassessment of the profession and of education for it should be flexible. It should not focus on curriculum details and other fine points.

Flexibility, the report adds, should also apply to the practice of licensing within engineering. The practice represents a restrictive influence in engineering education, the panel declares. It calls for an evaluation of the principle and for a review of the licensing laws.

Educators on the panel included Dr. J. Douglas Brown, provost of Princeton U., Dr. H. G. Stever, president of Carnegie Tech. and Dr. Henry T. Heald.

Its report is entitled "Assessment of the Goals of Engineering Education in the United States." Copies are available for $1.00 each prepaid from EJC, Department P, 345 East 47th Street, New York, N.Y. 10017.

New degree urged

DR. Wernher von Braun has proposed that colleges establish curricula in logistics engineering. Eventually, a college degree in that field should be established, he says, together with graduate level courses.

The rocket scientist, director of NASA's Marshall Space Flight Center, urges formal training for the new specialty to meet the complex needs of space exploration and the population explosion on earth.

He told the first annual meeting of the Society of Logistics Engineers at MSFC in Huntsville, Ala.:

"Logistics is a demanding field with a strong technical and managerial challenge. And yet, in many instances, we have had to assign this highly important task to an otherwise highly qualified engineer who has no formal training for this field, simply because a trained logistician was not available."

PHOTOGRAPHY CLASS VINTAGE 1908. "News in Engineering," published by Ohio State University, recently dug out this picture of a photography class of 58 years ago. The photograph was taken on the university's campus "green," which became known as the Oval in 1914. The first class in photography, designed for architects and engineers, was started in 1891 by Joseph Bradford. Incidentally, the gas mantle standard, in center background, will soon reappear in the university's physical plant, where a continuous light uninterrupted by power fluctuations is required.

Black box electronics

TWENTY years ago, the electrical engineering student had only the vacuum tube to contend with. He could spend a semester, perhaps an entire year, studying its physics and learning how to use it in practical design. But not any more. There just isn't time.

"In the past 10 years," says Prof. Leon Chua of Purdue U.'s School of Electrical Engineering, "the technology of electronics has become so advanced, and the physics of new materials so well understood, that we now have thousands of functional electronic devices. And more are coming almost daily."

So Prof. Chua teaches the Purdue undergraduate course in EE from the black-box point of view.

"I tell my students not to worry about what's inside a particular electronic device. I teach them to look at it simply as a black box. Period. All they need to know about it are its characteristics, and they can get this information from the manufacturer."

As working engineers after graduation, these Purdue EE students are not likely to panic every time they're up against a design problem that involves an unfamiliar device.

It'll be just another black box and they'll get on with their work.

People

• *Howard W. Johnson* (right) inaugurated as President of M.I.T. The 44-year-old former dean of the Alfred P. Sloan School of Management at M.I.T. said:

"I believe that the general range of problems attacked by M.I.T. in the future will shift more and more to those that understandably affect the ways in which our society lives, that this institution will increasingly exert its power toward problems of human significance."

• *Prof. Victor F. Weisskopf,* a researcher in nuclear physics, to become head of the Department of Physics at M.I.T. on February 1.

• *Prof. Louis D. Smullin,* who once bounced a laser light beam off the moon, appointed head of the Department of EE at M.I.T.

• *Carroll M. Williams* elected first Bussey Professor of Biology at Harvard. His work with the juvenile hormone of insects has portended a new kind of insecticide.

• *Richard D. Brauer,* authority on algebra and the theory of finite groups, named Perkins Professor of Mathematics at Harvard.

• *Dr. Philippe Shubik* appointed director of the Chicago Medical School's Institute for Medical Research. He's known throughout the world for his work in cancer research.

• *Dr. Barry Bernstein* named professor of mathematics at IIT.

• *D. Allan Bromley,* Yale physicist, now also in charge of new Arthur W. Wright Nuclear Structure Lab.

Fabian Bachrach

• *Prof. Abraham Schwartz,* chairman of Mathematics Dept. at City College (NYC), named Director of the School of General Studies.

• *Dr. Jacob L. Chason* named chairman of the Department of Pathology at Wayne State University School of Medicine.

• *Thomas D. Brock,* professor of microbiology, to direct $252,000 project at Indiana University to train specialists in ecology.

• *Dr. Rene A. Arcilla,* Assistant Professor of Pediatrics at University of Chicago, to direct new clinical research center in pediatrics established with initial U.S. grant of $352,000.

• *Prof. Harry A. Williams* of Civil Engineering at Stanford and *Prof. Leland H. Brown* of Electrical Engineering, both retired. Prof. Williams and Prof. Brown both joined the faculty in 1931.

It happened . . .

• *Case Institute of Technology* reported that the 520 members of its 1966 freshman class ranked higher in class standing and median College Board score in mathematical aptitude than any previous class in Case's history; 96 percent scored over 600 on the test and the class median was 701 out of a possible 800.

• *Penn State* College of Medicine released details of its curriculum plans for the Milton S. Hershey Medical Center, which opens next fall in Hershey, Pa. Among teaching innovations will be courses in behavioral science, the humanities, and family and community medicine. Students will also have a chance to study abroad one year.

• Three authorities on the narcotics problem were invited to *Cornell* for an educational program on campus drug use. The aim: "to inform the entire Cornell community and the area at large about the growing drug problem on campuses." Also at Cornell, a new department, Environmental System Engineering, was established by the college of engineering.

• *The University of Michigan* established two new master's degree programs in electrical engineering: master of science in electrical science and master of science in systems engineering—electrical.

• *The University of Georgia* inaugurated a unified introductory biology course. A prerequisite for all higher level courses, it gives students a foundation in bacteriology, botany, biochemistry, entomology, biopsychology and zoology.

• *The University of Hawaii* advanced from 23rd place in 1965 to 13th in 1966 among 187 public institutions receiving National Science Foundation funds for basic research.

• *Wayne State University* got a $4.6 million Federal grant toward its $22.5 million Basic Science Building, to be constructed in the Detroit Medical Center. Also at Wayne, a poll of 3,135 students showed how they rate the university's Applied Management and Technology Center. Forty-five percent gave it an A, the highest level of excellence; 43 p.c. gave it a B.

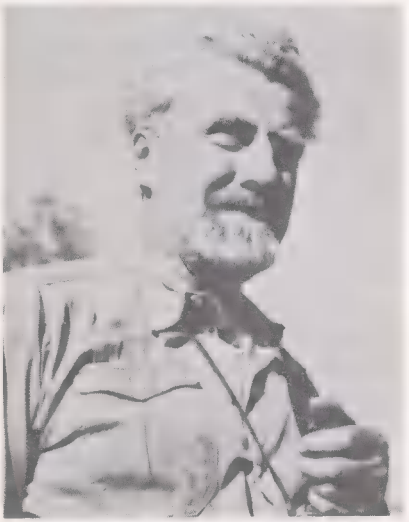
• *Yale* dedicated its Kline Biology Tower, a $12 million, 14-story research laboratory-science library, completing the Science Center.

Two Ohio State graduate students check new reactor used in nuclear engineering program. Dr. Donald Glower, chairman of program says it's a valuable teaching tool.

Photo: Union Carbide

BOOK IN THE NEWS

Why people must fight



All persons who have wondered why men wage war should read *On Aggression*. Konrad Lorenz (above) draws upon his knowledge as a naturalist to develop a chain of thought to grip the reader.

First, he discusses aggression in the animal world, what it is used for, how it operates, and its survival value to a species. Then he shifts into another realm:

"With humanity in its present cultural and technological situation, we have good reason to consider intra-specific [among members of the species] aggression the greatest of all dangers."

Lorenz deals with many aspects of normally occurring aggression from a naturalist's vantage point. This puts aggression in a new context, one that takes issue with many popular notions. For example, he details the spontaneity of aggression. Aggression is such a strong, persuasive force that it will pop up in unexpected outlets if its natural focus is removed. If all intraspecies competitors are taken out of an aquarium, Lorenz points out, some fish will attack and kill their mates.

Lorenz then turns to a human example, himself, in a prisoner-of-war camp. He explains the need to express aggression.

He contends: "A personal bond, an individual friendship, is found only in animals with highly developed intra-specific aggression: in fact, this bond is the firmer, the more aggressive the particular animal and species is. . . .

"If, in the Greylag Goose and in man, highly complex norms of behavior, such as falling in love, strife for rank order, jealousy, grieving, etc., are not only similar but down to the most absurd details the same, we may be sure that every one of these instincts has a very special survival value, in each case almost or quite the same in the Greylag and in man. Only in this way can the conformity of behavior have developed."

Lorenz is an excellent writer. He

is at home talking of cichlids, aggressive fish who fight one another for territorial rights. He is comfortable comparing human superstitions with the habits of his pet goose. He conveys, quite concisely, the phylogenetic [evolutionary history] development of animal rituals and cites similar human rituals without forcing the comparison. His examples evolve logically into a persuasive overall view.

Lorenz channels his discussion toward "militant enthusiasm," and shows how mass hysteria, valor, loyalty and other components of wartime psychology evolved.

He shows, from a naturalist's perspective, why aggressive ideas cannot be educated out of mankind, why they are absolutely necessary. Lorenz does not stop, however, after a description of the problem. He proposes specific outlets for appropriate aggression. Some of these are unexpected, such as the power of humor. Some are more traditional, for instance, scientific education for the populace.

On Aggression (Harcourt, Brace & World, Inc., $5.75) is a book of compelling interest. It should find a wide audience in this translation from the original German.—*J. R.*

"What in hell have you done with your baby brother"?

THE PROGRESS OF MEDICINE

Your blood is best

by Arthur J. Snider

A MAN injured in an auto accident was rushed to a nearby hospital. He needed a transfusion. A pint of blood was dispatched from the blood bank.

It was his own blood. He had donated it a few days before.

Dr. Israel Davidsohn, professor and chairman of the department of pathology, Chicago Medical School, cites the event in predicting the day of the personal blood bank account. Deposits would be made for withdrawals when needed.

"Advances in cryobiology (the science of preservation by deep cold) justify this hope," he says. "Storage would not require more space than safe-deposit boxes in banks."

Blood donation could start at birth.

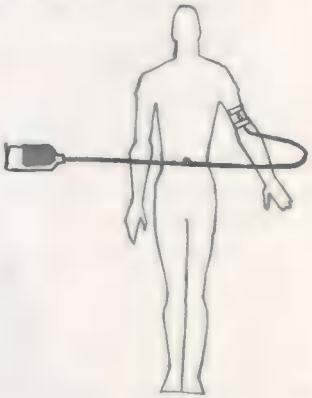
Sterile blood involved in the birth process could be preserved instead of thrown away.

The idea of putting blood in the bank for later withdrawal is not new. Dr. Davidsohn points out some surgeons today draw off a unit from patients a few days or a week before surgery to be returned to the patient during the operation, if needed.

"There is no better blood available for any of us than our own," he said. "It's a perfect match and is free of the hepatitis peril or any transfusion reaction."

Bone marrow, the source of blood manufacture, also has been banked, particularly by patients about to undergo radiation for cancer. Intensive X-ray treatment sometimes can damage the bone marrow.

"Just as in the case of red blood cells, marrow could be deposited and kept for years for one's own needs," says the pathologist. "Repeated deposits could be made without harm.



Another prospect is the ability to grow bone marrow cells in tissue culture. Similarly, it may be possible to cultivate other blood components.

Recent efforts in the medical profession to reduce the volume of blood transfusions are paying off. A blood specialist says about a 25 percent drop now has been effected without depriving patients of necessary blood.

Reason for the campaign is the rising number of transfusions and deaths. The 50 million blood transfusions given in the last two decades have sensitized a growing number of the population.

"Nearly one million transfusions administered in the United States each year have been considered unnecessary," comments Dr. Donald W. Smith of Miami, Fla. "These have resulted in 30,000 transfusion reactions and more than 1,000 transfusion deaths."

It is estimated that only one transfusion in 10,000 is completely compatible, considering the number of known factors that make blood different.

A hit with women

The "pill" is a hit with American women. Young American wives have shown an "extraordinary, immediate enthusiasm" for oral contraception, the first nationwide sampling shows.

Of the 24,645,000 married women under age 45, there are 3,815,000 using oral contraceptives, according to projections based on 4,808 representative interviews.

Dr. Norman B. Ryder, University of Wisconsin, study co-director, finds 6,400,000 have used the pill at one time or another and 4,700,000 others indicate they may use it in the future.

"Although the extent of use may be lower among Catholics than non-Catholics, the proportion of Catholics who report use is substantial indeed," Ryder reports.

Most extensive use is among young women who have attended college. Some 81 percent of white, non-Catholic married women, ages 20 to 24, who have attended college use contraceptives. An additional four percent say they may use it in the future to terminate their childbearing activity.

"This is indeed extraordinary for a procedure which was not even available until 1960," Dr. Ryder comments.

Patient, go home

Before the era of hospitals, sick people were cared for in their homes. A hospital administrator recommends a return to the home for some patients as a way of helping stem the tide of medical costs.

Mrs. Mary T. Ancker, administrator of the Lower Bucks County Hospital, Bristol, Pa., says the cost of a home care service program has averaged $7.51 a day per patient compared to about $44 under the hospital system.

The program was started after a survey showed 12 percent of the hospitalized patients could be taken care of at home if skilled nursing service plus medication and other hospital services were provided.

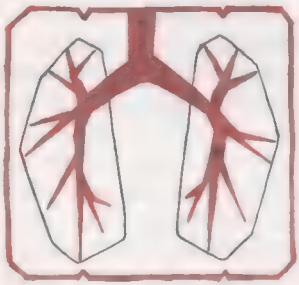
"Home care is not an outpatient service," Mrs. Ancker says. "Its purpose is to treat patients at home who would be obliged to remain in the hospital if the services of the home care department were not available."

Admission to home care requires a written order from the patient's physician. Records are frequently reviewed by a medical committee.

"Patients of all ages and almost every category of disease have been admitted to the service," she points out. "Some have been desperately ill and have made remarkable recoveries."

Technique wanted

Cancers of the lung grow so rapidly, the fate of the individual patient is almost sealed by the time the tumor is detected, a Philadelphia physician finds.



Dr. William Weiss determined the natural history of men aged 45 and over by means of semiannual chest X rays and questionnaires regarding symptoms.

Lung cancers, he found, are not recognizable on X-ray pictures until they reach a diameter of one centimeter, unless the physician knows where to look. By the time many lung cancers have grown to that size, they have probably developed about three-fourths of the way toward a fatal outcome.

Sense of death

Do the fatally ill have a premonition of death? Dr. Adriaah Werwoerdt of Duke University believes they unconsciously do.

In a year-long study of 30 persons, he sought to establish a relationship between survival time and how far a person looks ahead. He found the two seemed to be related.

"The ones who died early by and large had said they looked ahead one week or a month," he reports. "And those who died later said they had looked ahead six to 12 months."

Dr. Verwoerdt finds no evidence that a premonition of death exists on a conscious level.

28 who lived

The 73-year-old man fell over with a stroke.

He was deteriorating into unconsciousness and a one-sided arm and leg paralysis when taken to the operating room. A clot completely blocking the carotid artery along the side of the neck was removed.

Today, almost a year later, he lives happily retired with no symptoms.

He is but one of a large group of patients who have been followed up to determine how effective is the relatively new operation to remove the plug that blocks the flow of blood to the brain.

Such clots were once believed to be inaccessible to the surgeon's knife because they were thought to be well within the skull. It now is

known that at least a third of strokes are located in the upper neck artery, where they can be reached.

The operation has been done for about 15 years, but long-term followups to determine whether the arterial channel remains open have been rare.

One followup, extending up to four and a half years, is reported by Dr. Robert P. Hohf of Evanston (Ill.) Hospital. "Results of carotid artery surgery were encouraging in these 28 patients," he says. "The pessimism concerning total occlusion is unwarranted. Circulation can be reestablished."

The body's library

Add up the hereditary information in the genes of a single germ cell of your body and it would total a thousand books of 500 pages each.

Ask a battery of expert typists to copy the 500,000 pages 20 times—the number of times the cell and its daughter cells divided to produce a human being—for a total production of ten million pages.

How many typographical errors would the typists make? One per 20 pages of typing?

How many errors—mutations—does the body make in copying the coded instructions contained in the genes? Not more than one every 1,000,000 pages-equivalent.

George and Muriel Beadle use this analogy in their book, "The Language of Life," to underscore the fantastic precision with which genetic material is passed from one generation to the next.

Yet mutations do occur. Sometimes they are slight, like omitting an unimportant letter in a word. Writing "chromsome" for "chromosome" still makes sense. It is comparable to a single gene change and

would have the effect of creating a white forelock in a black head of hair.

But sometimes mutations are severe. Accidentally shift the fingers on the keyboard one key to the right and the sentence "Genes are the blueprint of you and your descendants" comes out "Hrmrd str yjr n;ir½tomy pg upi smf upit frdvrmfsmyd."

The stenographer must eliminate it and so does the body. If that particular gene system controls a characteristic essential to the life of the individual, it would mean death.

Of the 250,000 defective babies born in the United States each year, about 50,000 are due to heredity, the National Foundation estimates. Another 20 percent are due to envi-

ronment, such as German measles or thalidomide. The rest are believed to be a combination of heredity and environment.

In recent years, significant progress has been made in elucidating gene anomalies that result in a missing, defective or inactive enzyme system responsible for triggering a key reaction in body chemistry.

Like a stalled car causing a big traffic jam on the expressway, a defective enzyme can cause a mammoth chemical blockade in the body.

If a baby inherits a defective enzymatic gene from each parent for a disease called galactosemia, it will be unable to metabolize a sugar substance (galactose) found in milk. Galactose accumulates in the body tissue, particularly in the brain, to cause mental retardation.

Other diseases are being identified as due to similar chemical defects. More than two dozen have mental retardation among their consequences. Special diets have been devised which often can prevent brain damage when started in time. These treatments have raised hope that similar treatment measures can be found for other so-called inborn errors of metabolism.

Shock treatment

Patients in a state of irreversible shock may be saved some day if their circulation is temporarily connected to that of a healthy, normal person. The possibility is envisioned in animal studies by Dr. Lester R. Bryant of the University of Kentucky.

Such cross-hookup of blood vessels has been carried out after the animals were matched for blood compatibility. Survival rate was 80 percent in the experimental animals as compared with 10 percent in the control animals.

"In some cases of severe shock, whether due to major injury or disease, all standard methods of treatment fail to save the patient's life," Dr. Bryant points out. "Studies have suggested that such patients dying in shock do so because irreversible changes have occurred in vital tissues of the body. Even though presently available methods of treatment may temporarily restore the patient's blood pressure and circulation, the tissues and organs are unable to repair the damaging effects of the state of shock of their own accord and death still occurs.

"It seems feasible that some of these patients might be saved by cross circulation with a normal, healthy person. Under these circumstances, the blood of the shock victim would be exposed to the normal tissues and organs of the healthy donor."

Since the function of the circulating blood is continually to repair and restore the tissues of the body from the effects of wear and tear, Dr. Bryant believes it is logical that the circulating blood of a normal person might be able to repair the tissues of the patient.

PERSONALITY OF THE MONTH

He won $25,000

NOTHING quite equals the Nobel prizes, but in the United States today the closest approximation is the annual Arches of Science Award. Given by the Pacific Science Center in Seattle, Wash., the second such award went recently to Rene Jules Dubos (above).

The award consists of a gold medal and a $25,000 prize.

Dr. Dubos became one of the great world personalities of science as a microbiologist and experimental pathologist who first demonstrated the feasibility of obtaining germ-fighting drugs from microbes over 20 years ago. Much of his work has concerned tuberculosis, including studies on the mechanisms of acquired immunity.

His more recent work has dealt with the role of microorganisms in the development and functions of the gastrointestinal tract.

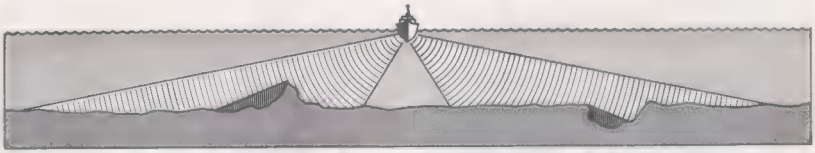
Today, Dr. Dubos is concentrating on the role played by so-called early influences on a developing organism during the prenatal and early postnatal period.

How deeply such influences affect life are becoming apparent in a nutrition experiment in which he has given pregnant and lactating mice a corn-dominant diet of a kind eaten by Guatemalan Indians. There is a slight deficiency of lysine and threonine, two amino acids, in the diet. Physically, the offspring of such mice never develop as do other mice, even though they may be well fed from the time they are taken off their mothers' milk.

Dr. Dubos is a native of France who came to the United States in the 1920's. Today, he is a professor at The Rockfeller University in New York City, and his concern reaches far beyond the laboratory.

"Public discussions of the sociology of science should reach even into the organization of the scientific enterprise itself," he told an audience that gathered at The Rockfeller University to hear the announcement of his choice as the Arches of Science Award winner.

"New social techniques must be developed," he added, "to determine more rationally the relative amount of support to be given free basic research, mission- oriented research and applied research. There is much evidence that certain fields of science are neglected."



In side-looking sonar, acoustic beam fans out like light beam. Reflections show shadows.

I see where they...

From the Editor's desk

. . . see great promise in a side-looking sonar to let you see large land areas under water. A Batelle Memorial Institute specialist in photogrammetry says it may become as valuable for mapping the ocean floor as the aerial camera is for land mapping.

Joachim G. Stephan of the Institute's Columbus, O., Laboratories says map makers need no longer depend on slow spot soundings. Instead, the side-looking sonar beam scans the ocean floor for them much as a slanted beam of light sidelights the landscape below it.

Each sonar echo is displayed on an oscilloscope or paper recorder. Elevations produce shadow zones behind them. Depressions produce shadows beyond the closest rim.

At a normal height of 225 feet above the ocean floor, the scanning devices have a range of 1,230 feet on either side of the vehicle.

. . . say a man may be allergic to his wife. A British study reported by *Medical World News* indicated that men suffering from nonspecific urethritis were sensitive to their partners' secretions. In trials now under way using inoculations with the secretions, doctors at London's Middlesex Hospital have found indications of densensitization.

. . . have come up with seven ways of telling who has an alcohol problem. Dr. Morris E. Chafetz, director of the alcohol clinic of Massachusetts General Hospital in Boston, singles out the person who: 1. by his own or his colleagues' definition has been intoxicated four times in one year; 2. goes to work intoxicated; 3.

must drink to get to work and do his job; 4. drives while drunk; 5. hurts himself badly enough while drunk to require medical attention; 6. tangles with the law as a result of being drunk; 7. does something under the influence of alcohol he says he would never do otherwise.

Such people aren't necessarily alcoholics, but they lean that way, Dr. Chafetz says. He blames the problem in part on cultures that paradoxically accept drunkenness because their puritanism makes them feel guilty about drinking.

What problem drinkers can do, he added: Sip the drink slowly between bites of food while relaxing comfortably in a group.

Dr. Chafetz spoke in Madrid, Spain, where people do just that and intoxication is abhorred.

. . . have developed "handwriting" experts to read radar "signatures" of alien satellites. RCA and defense agencies have developed techniques that "tell all." Radar reflections of an orbiting target, received in the form of wiggles and waves, are called "signatures" because they differ in configuration, body motion and other factors.

By studying them, scientists can tell whether satellites are manned or unmanned, whether they are tumbling, rolling, spinning or stabilized, and whether their mission is military or peaceful.

The technique also reveals satellite size and shape.

So far, human operators have been needed to interpret the data. But RCA is now developing ways of using computers and other electronic equipment in the program.

. . . claim palm-reading can tell volumes about your diseases. Dr. Harold F. Falls of the U. of Michigan says, "The eye and the hand are unique, in that no two other organs or structures of the body can offer such a wealth of diagnostic information."

They can show signs of 17 metabolic disorders, three kidney syndromes, five chromosomal disorders and a wide variety of skin disorders.

Among the hands' signs: skin and hair pigmentation, tremor, muscular atrophy, deformities of the nails, joints and fingertips, and a wide variety of growths, lesions and skin textures.

. . . have issued a new invitation to scientists to go into orbit. NASA and the National Academy of Sciences are looking for people "to conduct scientific experiments in manned orbiting satellites and to observe and investigate the lunar surface and circumterrestrial space."

Specifications: U.S. citizens, not over 6 feet tall, born after August 1, 1930, with a doctorate in the natural sciences, medicine or engineering.

Write: Scientist as Astronaut, NAS, 2101 Constitution Avenue, N.W., Washington, D.C. 20418. Deadline for applications: Jan. 8, 1967.

INVENTIONS PATENTS PROCESSES

Tiny engine — big job

A JUNIOR-SIZED jet engine—the six-pound Resistojet—can maneuver a thousand-pound spacecraft from one orbit to another. Developed by Avco's Space Systems Division for NASA, this midget power package, only 11 inches long, uses a mere seven and a half watts of power to provide its giant-sized thrust.

Resistojet thruster—1¾ inches long—is compared in size with a 100-watt light bulb. It is propelled by ammonia fuel.

In order to maintain a spacecraft's relative position in space, two stainless steel thrusters, powered by solar energy, are capable of operating independently to move the vehicle clockwise or counterclockwise. Each thruster is one and three quarters of an inch long.

The engine's miniature working components are contained in an area about four inches square. Capable of holding enough ammonia fuel for three years' operation, the storage and feed system is designed to operate outside the earth's gravitational pull.

High specific impulses increase the amount of energy produced by each pound of propellent, cutting down the amount of fuel carried aboard the spacecraft and reducing the total weight at launch.

The propulsion system will be evaluated by Goddard's Auxiliary Propulsion Branch for possible use on NASA's Applications Technology Satellite (ATS).

Untapped milk source

Infertile cows may soon prove a profitable, and huge, source of milk for the dairy industry.

Two Michigan State Univ. scientists have developed a method that

can produce commercially acceptable levels of milk from unbreedable cows.

Coaxing milk from motherless cows is not a novel idea, but until now two obstacles prevented these cows from giving enough milk to fill minimum commercial requirements: insufficient udder development; and no reliable method to incite milk production after the udder is developed.

Drs. Joseph Meites, and H. Allen Tucker believe that estrogen and progesterone, hormones secreted by the ovaries, can stimulate mammary growth. They've also discovered that hormones from the cortical portion of the adrenal glands can provoke lactation.

Besides the enormous boost to milk output, this project could provide a measure of salvation for the 20 percent of the nation's dairy cattle that are slaughtered yearly because they can't be bred and can't give milk.

With artifically induced udder development and lactation, keeping these cows alive will prove more profitable for the dairymen.

During the researchers' experiments, it became apparent that animals furthest along in pregnancy usually give the most milk, a happenstance attributed to their greater udder development. It was at this point that the two men puttered with different combinations of estrogen and progesterone to develop the udder to the size it would be at the end of pregnancy.

This fall, the MSU scientists began testing best combination of these hormones to unbred cattle to see if acceptable milk production can be achieved, the fine point on which the case for the study rests. But even if unsuccessful, the experiments may still provide benefits. About one-third of the cows could be bred after lactation has been induced. Many of the animals given hormones gain from 100 to 300 pounds, and larger animals often give more milk.

How to get a patent

A brainstorm may give you the idea for a superior rat trap or a perpetual motion machine. Then you may be stymied by the mysteries of patents and how to sell your invention. If so, Stacy Jones' up-to-date *The Inventor's Patent Handbook* (Dial Press, $5) is a thorough and specific guide for aspiring inventors.

The book is arranged in chapters designed so that answers to well-formed questions can be found readily. It details, for example, how to submit an idea to a corporation, what your rights are, what the business rights are and what type of reception an independent inventor may expect. It explains the usual contract for an inventor on a company or government payroll. And the book bolsters extensive information with step-by-step case histories.

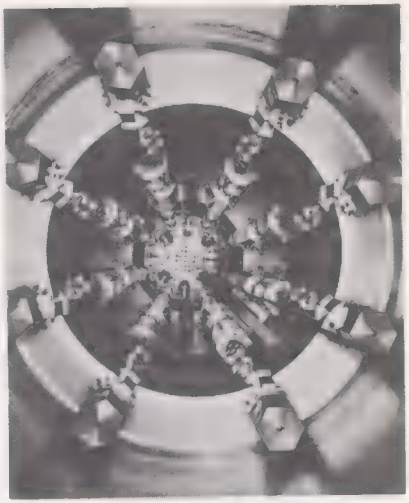
The *Handbook* tells the advantages of hiring a patent attorney.

These include a knowledge of engineering and an ability to translate technical knowledge into precise, concise technical and legal terms. He can search issued patents and distinguish a new invention's virtues over the present state-of-the-art. The book specifies the steps a lay person can take himself to see if his idea is patentable. Legal proceedings common in patent cases such as prosecution, issuance, interference assignment and infringement are explained in everyday terms. Even typical fees for various services are listed so the reader can gain an idea of the cost of a patent. A patent of average length and complexity costs about $229 in Patent Office fees and from $200 to $500 in attorney's fees.

The author offers a list of practices every potential inventor should follow: how to keep records, how to store them, when to have witnesses sign sketches and see descriptions.

Other areas such as design patents and the history of the patent system are included. The book is a complete guide to patents for a lay inventor or someone interested in surveying the field of inventors as thoroughly as possible.

The appendices cite pamphlets available from the Patent Office, excerpts from the U.S. Code pertaining to patents, a rundown of the patent practices in foreign countries, one by one, and even a library-by-library list of institutions that receive and keep on file the *Official Gazette*. —*J. R.*



INSIDE A REACTOR

What looks like metal shish-kabobs are actually nuclear reactor control drives. These units position 16 neutron-absorbing rods alongside the reactor core to absorb neutrons and shut down the chain reaction. Moved by the control drives, the rods are inserted into the nuclear reactor so rapidly that they can travel 12 inches in 165 thousandths of a second, immediately bringing the reactor below the critical point. Similar control units have been developed by Diamond Power Specialty Corporation for 17 reactors around the world.

New ways to cut

A supersonic stream of water can cut a swath through inch-thick concrete or 55 layers (two inches) of cotton-nylon fabric without losing a drop.

This cutting marvel is a tiny jet of water five thousandths of an inch thick, propelled through the material at three times the speed of sound (3,000 feet per second).

The machine operates with a

water pressure of 50,000 pounds per square inch and a flow rate of 40 gallons per hour. (Regular water tap at full blast gives 18 gallons per hour at a pressure of 35 to 65 pounds per square inch.)

Prof. Norman C. Franz, one of the technologists on this University of Michigan project, claims that new equipment with 100,000 to 400,000 pounds of pressure per square inch and a flow of a few hundred gallons per hour can whip through 20 inches of concrete.

The liquid jet offers advantages of speed, flexibility, low waste and no tool wear over the marginal assets of standard cutting tools. In cutting lumber, for example, the water cut is only a few hundredths of an inch, while a saw cut is a quarter of an inch, meaning the loss of one one-inch board out of five.

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A saw with a built-in table has been designed to cut blocks of steel up to 28 inches thick, six feet wide and more than 100 inches long.

Recently installed in the tool steel warehouse of Allegheny Ludlum Steel Corp., the saw itself is of conventional design, but the table portion of the instrument is unique. Operated electronically, the table brings the material to the saw instead of the saw moving into the metal so that the saw can be preset for different speeds for special alloys.

WAVE MAP

A project to flatten the earth won't disrupt the globe's three dimensions, but it will permit oceanographers to forecast ocean waves much as weather is predicted (but with more accuracy, it is hoped).

Called the icosahedralgnomic projection, the method mathematically flattens the earth's geography, without warping its features, by converting the globe into 20 triangular segments.

This map projection, (on wall) developed by Lockheed-California Company oceanographers, was prepared with the help of computers.

A globe's great circles are drawn as straight lines on the new flat map. A wave forecast based on a grid network overlaying the new map is made via computer. Data is then transferred, point by point, to premarked locations on the conventional globe.

INVENTOR OF THE MONTH

Stock forecaster

John M. Lambert readies stock data for his forecasting computer to evaluate.

WHAT stocks are going to sell higher, and when? In the 1960's it is natural for such forecasts, made by mental or pencil calculations ever since share trading began, to be assigned to the computer.

John M. Lambert, *Science Digest* Inventor of the Month, was recently granted Patent 3,270,190 for an electronic securities evaluator in whose record he takes some pride. Over the last five years, the machine has made five million predictions. Lambert said the other day that it was right on three million, wrong on one million, and inconclusive on the fifth million. This he regards as a batting average of about three out of four.

Of the 10 mutual funds that did best last year, seven used the computer's service.

The inventor, an electronics engineer who formerly ran the General Electric Company's systems evaluator at Syracuse, N.Y., is now president of the Electronic Stock Evaluator Corporation, Rockville Centre, L.I.

In the company's quarters, the patented computer analyzes the prospects of 1,800 stocks every week. The equipment, mounted on racks, is 10 feet long, 8 feet high and 3 feet wide.

The variables fed into the computer include per-share earnings, dividends and asset values, and company sales, as well as the price range and volume of the stock itself.

Prices can be forecast as far ahead as earning projections are available from the company, statistical agencies or brokers.

What about a bear or bull market? If the client asks it, the predictions can be made in three sets—for boom, bust or normal conditions.

Lambert counts among his clients more than 50 large mutual funds, trust companies, banks, brokers and professional inventors who supervise assets totaling more than $20 billion. Some clients are reported to pay $10,000 a month apiece for the advisory service.

—*Stacy V. Jones*

TIPS AND TRENDS

WANT A JOB IN MIAMI, LOS ANGELES, DENVER? Call Western Union. The telegraph company now offers a nationwide job-finding service that will be linked to a computer network.

NOW, SCRAMBLED TV. For security-minded people using TV for visual communications, a Philco-Ford device scrambles/unscrambles it.

YOUNG SKIN AT 60. Polymer chemists can curb the deterioration of some rocket fuel ingredients. "We are convinced that this same miracle can be wrought with human skin, which after all is only a chemical polymer with the added characteristics of being able to repair itself." Source: Dr. Werner Kirchner of Aerojet-General, Sacramento, Calif.

BIND A SNAKEBITE VICTIM'S LIMB LOOSELY. So says Dr. Newton C. McCollough, explaining that a tight tourniquet keeps the venom in. Binding should be as loose as a necktie.

SCIENTIST'S INFORMATION SERVICE. Automatic Subject Citation Alert, prepared weekly by Institute for Scientific Information, Philadelphia, culls 1,500 scientific journals for citations of articles on any subject.

ATTENTION, MOTHERS. A majority of diaper rash medications do not help and may even be harmful. So says Dr. Hans G. Keitel, Ortho Research Foundation, Raritan, N.J. Where powders help, he found, it's because they absorb moisture containing irritants.

LOOK FOR NEW ANTIBIOTICS. FDA is reported to be checking a wide range of new ones. There'll be one answer to the resistance bacteria has developed to the older ones.

CHINA'S SCIENCE REVIVES. The revival, says a British physicist after a visit there, will bring about "by far the largest scientific and technological force in the world," perhaps before the end of the century.

HOW TO GROW GOOD CROPS IN SANDY SOIL. Place a layer of asphalt two feet beneath the surface to keep moisture where crops can use it. That's the idea of Clarence M. Hansen and A. Earl Erickson, Michigan State U.

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION
(Act of October 23, 1962; Section 4369, Title 39, United States Code)

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Back to symmetry

by Jeanne Reinert

THE hue and cry among physicists that dogged the downfall of symmetry (see "Death of a Theory," Sept., '66) has been revived.

In a contest more pitched than a tournament chess game, the symmetrists have scored a comeback checkmate. Their move is a research report of an experiment duplicating the one that caused the furor. The new study, seven times as large, gives exactly the opposite results.

The question of symmetry is one of the most basic confronting physicists today. The long-held theory of the nature of the universe is that a few symmetry principles are the two-by-fours of structure upon which the apparent confusion of atomic structure and behavior is built.

Last summer, Dr. Paolo Franzini of Columbia University and his wife, Dr. Juliet Lee-Franzini of the State University of New York, studied the eta meson, a nuclear particle with no electrical charge and a short life.

Their experimental setup was in the 33-Bev Brookhaven accelerator. There, they bombarded eta mesons with protons to break the mesons into their component parts, three pions. One pion is positive, one is negative, one is neutral in charge.

Photos of the collisions that broke up the mesons showed tracks of the departing pions, a measure of their energy. The energy would have been equal if symmetry had been preserved.

The results showed that the eta meson emitted positive pions with a higher charge than the negative pions. If all the variables were controlled, then symmetry did not exist. Earlier experiments on a smaller scale had suggested this might be the case. Dr. Franzini said at the time that the odds were 80,000 to one against the findings' being a statistical fluctuation.

But perhaps they were.

Using the 25-Bev accelerator of CERN (European Center for Nuclear Research) in Geneva, a group of physicists conducted the same experiment. But it was seven times as extensive. The group examined 10,665 photos and found no evidence for asymmetry.

The 450 participants at the 13th International Conference on High Energy Physics at Berkeley, California, stirred when the results were announced. Physicists were unwilling to try to explain the discrepancy. But they were impressed by the comprehensive CERN study.

Meanwhile, Dr. Franzini pledged himself to another experiment. "If we get the same results again, it will be hard to believe our findings were accidental," said he.

Six motherless monkeys cling adhesively to one another in a wistful effort to compensate for the body warmth and maternal affection they have been deprived of since birth.

Rough-and-tumble play or "controlled aggression," says Dr. Harlow, is a normal part of primate development. But security is necessary if aggression is to remain controlled.

Motherless monkeys

WHAT causes a monkey to grow attached to its mother? Can the early stages of a monkey's development tell us anything about the early development of human beings?

These questions are the crux of studies being conducted by Dr. Harry F. Harlow, director of the Wisconsin regional Primate Research Center, administered by the Graduate School of the University of Wisconsin.

In one phase of his lengthy monkey investigation, Dr. Harlow took rhesus monkeys away from their mothers at birth and put them in cages to be "raised" by a cloth surrogate, a doll built vaguely to resemble a monkey's real mother. The frequently shattering effects of this experience and other phases of his experiments are pictured on these and the following pages.

Above: Dr. Harry Harlow supports a distraught monkey who has latched onto its terry cloth "mother" as though its life depended on it. Its early emotional life may depend on it, according to study.

Left: Monkey cringes in corner of its cage after being released from isolation. Withdrawn and frightened, it exhibits self-clutching pattern seen in monkeys who have not had normal animal contact.

Below: Mother and child penned in together present anything but a picture of harmony. The brutal mother, herself raised without a mother, viciously pushes her baby's face to the ground to crush him.

Infant monkeys respond spontaneously to each other during play period designed to test their ability to socialize during or after experiments. The animals are placed in observation rooms in groups of four.

Of the four baby monkeys cavorting in the recreation room at left, one is frisking about on the wire grid, a second (background) seems to be self-involved, while others are still attached to surrogate.

For story details on Dr. Harlow, "father of the cloth mother," see the pages that follow.

Man behind the monkeys

BEHIND the famous motherless monkey experiments is a man who has been fascinated by primate behavior for 30 years. For the past nine years, Dr. Harry F. Harlow, internationally lauded for his work in experimental psychology, has been enmeshed in studies to explore the development of a monkey's personality.

As part of his long-range study, Dr. Harlow separated monkeys from their natural mothers at birth. To help him analyze the monkeys' responses to orphanhood, he concocted out of terry cloth and wire a surrogate (substitute) mother for his tiny charges. The gingerbread-faced "mothers" were lodged in cages with the baby monkeys to provide the maternal presence needed to raise an infant.

Some of the experimental monkeys were partially isolated with their "mothers," kept in cages where they could see and hear other monkeys but could not touch them. Others were completely isolated from peers and family alike, their only companions, the stiff-bodied surrogates. This early maternal and social deprivation registered clearly in the behavior of the monkeys. Under some conditions, monkeys grew into the playful creatures monkeys are supposed to be. Where they were isolated from ordinary animal attachments, the monkeys were transformed into neurotics or psychotics.

Dr. Harlow's findings reverse, at least in the laboratory, two popular concepts of maternal influence. He ascertained, first, that intimate body contact, not breast feeding, is the determining factor causing the attachment. Second, he showed that peer affection after a certain point is probably more important to the monkey than motherly affection.

On the basis of information gleaned from his earlier studies on monkey's ability to learn, the doctor and his wife, clinical psychologist Dr. Margaret Kuenne Harlow, identified five affectional systems in the monkey: 1) infant-mother; 2) mother-infant, maternal; 3) peer affectional; 4) heterosexual; 5) paternal.

"We were always skeptical of the Freudian theory that the mother-child relationship is primarily responsible for social adjustment," explained Dr. Harlow.

Despite the importance of the mother's role, the doctor believes that once basic security with the mother is established, affection for

Adapted from SK & F *Psychiatric Reporter, July-August.* ©1966.

peers, developed through play, is probably more important.

"We've raised baby monkeys with no mothers whatsoever, with surrogates and with incredibly brutal mothers," he continued, "yet so long as they had playmates, they . . . make adequate or good social adjustments. We've raised babies with only the mother and no playmates and after at least eight months of this, our experiments seem to indicate that an infant will probably be forever socially abnormal." Just why mother-child affection is important in the early stages of life is expanded in Dr. Harlow's socialization thesis.

Within the first few hours or days, according to the theory, social animals develop an affection for members of their own species, especially for the mother figure. At a later time—60 to 100 days with monkeys, between six and ten months in children—a fear of strange objects matures. Dr. Harlow thinks that unless an animal has developed security before that time, he's in trouble.

The trouble begins when young monkeys, at a year or so, start to indulge in aggressive play with other monkeys. Far from being an antisocial action, *controlled* aggression, the doctor maintains, is a normal response in the primates and is "one of the mechanisms that helps them develop social roles." If affection for their own species members hasn't developed by the time aggression matures and if controlled aggression through play hasn't occurred, adjustment to their environment will be very difficult.

Dr. Harlow's use of the word matures brings up the question of inherent animal behavior. He contends that fear *is* innate, that human superiority over animals is just as much due to man's having incredibly more complex unlearned behaviors than to his far greater intellectual ability. But because primates (including humans) learn so rapidly, instincts are almost immediately blanketed by learning.

This postulate was borne out by two experiments. When very young, the monkeys in this study were not afraid of anything. But later on, when shown a toy monster, they ran to their mothers in terror.

"There was no way that they could have learned to be afraid of the toy," says Dr. Harlow.

Using a different technique, Dr. Gene Sackett flashed pictures of monkeys on screens in cages of monkeys being raised in isolation. Between 57 and 80 days after birth, the animals were frightened by pictures of monkeys in threatening poses, but not by any other kind of picture.

Dr. Harlow admits there are a number of limitations in applying results of monkey research to human beings—the maximum IQ of monkeys is 25; they have no symbolic language; the father role is negligible, if it exists at all.

But he adds firmly, "I am unintrigued by any monkey research that I don't think has at least some bearing on the human being."

KFS

This picture of a "flying saucer" taken in California looks suspiciously like a flying straw hat. Some have been impressed by the apparent dust cloud (whitish area) saucer seems to be kicking up. But a close look shows that there is a similar white "cloud" farther down the road where there is no saucer.

UFO's—
what a new investigation may reveal

by Daniel Cohen

By now one thing should be abundantly clear: Interest in flying saucers, or unidentified flying objects, is not going to fade away.

The UFO (pronounced U-Foo) "mystery" began nearly twenty years ago and today public interest and concern is as high, if not higher, than it has ever been. A small but vociferous minority believe that there is undeniable evidence that most of the UFO sightings are spaceships from other worlds. The majority of Americans would not go that far, but there are an enormous number who think such visitations are at least a good possibility.

Moreover, the UFO controversy has created the nasty suspicion that the U.S. Air Force, and quite possibly the entire government and large segments of the American scientific

community as well, are engaged in a sinister conspiracy to cover up the "truth" about flying saucers—the "truth," of course, being that the UFO's are extraterrestrial observers.

Since 1948, the Air Force has had the thankless task of investigating UFO's. The last report of Project Blue Book, the Air Force UFO program, issued in February, 1966, noted that of 10,047 sightings since 1947, only 646 of them remained unidentified.

A sighting is considered unidentified, according to the Air Force, "when a report apparently contains all pertinent data necessary to suggest a valid hypothesis concerning the cause or explanation of the report but the description of the object or its motion cannot be correlated with any known object or phenomena."

This small number of unknowns does not bother the Air Force very much. The report states: "To date, the firm conclusions of Project Blue Book are: (1) no unidentified flying object reported, investigated, and evaluated by the Air Force has ever given indication of threat to our national security; (2) there has been no evidence submitted to or discovered by the Air Force that sightings categorized as unidentified represent technological developments or principles beyond the range of present-day scientific knowledge; and (3) there has been no evidence indicating that sightings categorized as unidentified are extraterrestrial vehicles."

The opinion of the Air Force is clear, but obviously a great many people are dissatisfied with the way the UFO phenomenon has been handled and unconvinced by the Air Force's conclusions.

Even the Northwestern Univ. astronomer Dr. J. Allen Hynek, chief scientific consultant on UFO's for the Air Force, has called for an expanded UFO study. In a letter to *Science,* the official publication of the American Association for the Advancement of Science, he chided his scientific colleagues for not tackling the subject, and he noted that a really comprehensive scientific investigation is long overdue.

At a scientific meeting, Dr. Hynek said: "The myth is not put to rest, and the scientific fraternity must now take cognizance of them (UFO's). When I started to investigate this phenomenon in 1948, I thought the whole thing would go up in smoke. It has taken till now for serious scientists to begin to look at the phenomena with care and caution."

During his investigations Dr. Hynek has run into a small number of cases that he calls "real brain teasers." He thinks that selected cases like these deserve at least as much study as a kidnapping or a plane crash.

The number of sightings reported to the Air Force rose from 399 in 1963 to 562 in 1964 to 886 in 1965, and 1966 promises to show an even greater total. Even though the percentage of sightings that remained unidentified in those years

declined, the Air Force felt it was once again being put on the hot spot. It was uncomfortable to recall the years 1948-52 when UFO reports created mass confusion and even near hysteria in some parts of the country.

Early in 1966, a meeting of a Scientific Advisory Board *ad hoc* was called at the request of the Air Force Public Information Office to study the UFO situation. The committee praised the work of Project Blue Book and warmly supported its conclusions.

But this was not enough. Blue Book's procedures were tightened up. More significantly, the Air Force appropriated $313,000 for an intensive 15-month study of the UFO phenomena by a group of universities. The Air Force was to pick a "leading" university which was then to choose four or five cooperating institutions to conduct an intensive and independent UFO study. The universities would send out teams of physical and social scientists to look into the best UFO sightings.

The Air Force reportedly encountered some difficulty in finding a university willing to take the lead in such a study, because the institutions feared involvement with such a controversial and well publicized subject. But finally, the University of Colorado agreed to pick up the grant and the project began last month (see opposite page).

Scientific director of the University of Colorado project is Dr. Edward U. Condon, professor of physics and former head of the National Bureau of Standards, and an important figure in the development of the atomic bomb. Project headquarters will be in the University campus in Boulder, Colo.

Dr. Edward U. Condon

Many of those who believe firmly in the existence of spaceships have already discounted the results of the U. of Colorado study in advance. They argue that since the study is backed by the Air Force, any conclusions that do not follow the "official line" will be suppressed. The official line, according to the believers, is that there are no spaceships.

It is because conclusions might have to be kept secret that the Air Force had a tough time finding a university to conduct the study. So goes the rumor heard in saucer circles. Clearly, it is necessary to deal with the charge of an Air Force conspiracy of silence, before

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Scientist for the saucers

DR. Edward U. Condon, scientific director of the new University of Colorado study of unidentified flying objects, says he is an "agnostic" on the subject. He neither believes nor disbelieves in the existence of flying saucers.

Dr. Condon says that he has never personally seen a flying saucer, and that he had no special interest in the subject before he accepted the job of directing the project. But he says he is looking forward to the investigation.

Why was he selected? Dr. Condon thinks it was because "I am a very good physicist."

At a press conference, Dr. Condon offered these opinions:

"There are a high number of unexplained sightings"; Air Force studies to date "have not been very thorough"; the idea of extraterrestrial spaceships is improbable and "it would take very good evidence to convince me."

According to Harold Brown, Secretary of the Air Force, the University of Colorado at Boulder was chosen for the study because the National Center for Atmospheric Research (NCAR) and the research headquarters of the Environmental Science Services Administration (ESSA) are located there.

Dr. Condon will direct the scientific phases of the work while Robert J. Low, currently assistant dean of the University's graduate school, will serve as project coordinator. Principal investigators working with Dr. Condon will be Dr. Franklin E. Roach, an astrophysicist from ESSA, and Dr. Stuart W. Cook, chairman of the University's psychology department.

The Air Force will give Dr. Condon's group all the information it has on UFO's. Since a reportedly small percentage of it contains classified data (such as the launching of a secret military satellite), it will not all be made public. But Dr. Condon says, "The holding back of such essential security information will not be made a cover for withholding basic data."

To avoid duplication of effort, Dr. Condon requests that the public still make UFO sighting reports to the Air Force. But he notes, "Reports may be received by the University group at Boulder when there is some special reason to handle them this way." He also assures witnesses that they may talk to investigators and still have their identities withheld.

A planning meeting of the committee and officials from the Air Force UFO project was held in Boulder at the beginning of November, but Dr. Condon does not really expect the project to get rolling until the beginning of February, when the school year starts. Of course, if something really sensational comes up before then, Dr. Condon's team will be ready to go into action.

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any rational discussion of UFO's can take place.

The believers, led by Maj. Donald E. Keyhoe (U.S.M.C., Ret.) chairman of the National Investigations Committee on Aerial Phenomena (NICAP), paint a picture in which the Air Force operates a widespread news blackout and, by intimidation and ridicule, has managed to silence large numbers of military men, scientists, civilian pilots and ordinary citizens from telling what they know about UFO's.

Since NICAP is probably the largest and by far the most aggressive of the saucer organizations, it has been able to get a good deal of publicity for its pet project of a Congressional investigation of flying saucers to "break the secrecy wall" and expose the "true facts" about UFO's.

The Air Force Blue Book report points out that the former Chairman of the House Armed Services Committee, Carl Vinson, opposed such hearings because he thought they were unnecessary. But Rep. Gerald Ford (R-Mich) seriously proposed an investigation shortly after a well publicized rash of sightings took place in his home state in March, 1966.

The idea, however, has not attracted too much interest in Congress and is opposed by most scientists, who feel that Congress is the worst possible place to air a scientific discussion with emotional overtones. The Congressional investigation idea will probably never get off the ground.

Solid evidence to support the conspiracy theory is not merely weak, it is virtually nonexistent. At first, the Air Force UFO project was secret, but since 1953 secrecy has been abandoned and the Blue Book case files at Wright-Patterson Air Force Base near Dayton Ohio have been open to journalists and even to members of anti-Air Force UFO organizations. Air Force investigations and explanations of UFO's are sometimes rushed, inadequate or just plain sloppy, but inefficiency and conspiracy are not synonymous, although many saucerians seem to think they are.

Far from harassing or ridiculing witnesses as the UFO groups claim, the Air Force has usually been polite and tolerant. A case in point involves the New Mexico policeman Lonnie Zamora.

In 1964, Zamora saw what he thought was a strange egg-shaped vehicle which had landed or crashed in a gully, and took off shortly after he spotted it. The Air Force had ample opportunity to dismiss or ridicule the report: Zamora was the sole witness, radar in the area picked up no strange craft, Zamora admittedly had poor eyesight and was not wearing his glasses, Zamora's superior officer arrived at the scene minutes after Zamora said the vehicle took off and found that the vegetation that the departing ship was supposed to have set on fire was cold.

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What to do if you see a flying saucer

1. ***Don't panic.*** There are a lot of stories about people being injured or even killed by saucers, but there is not a single well-authenticated case of this.
2. ***Don't jump to conclusions.*** Remember that chances are you are seeing a perfectly ordinary object under unusual conditions. If you quickly decide you are seeing a spaceship, you will be less able to remain an objective observer.
3. ***Try to remember*** the exact time you sighted the object, the direction in which it was going, the height at which it appeared or disappeared, the duration you saw the object, its color, whether or not it made any sound and the angle it made with the horizon. You may also try to estimate the size of the object by comparing it with the moon or a planet or a star. But accurate estimates of size, speed and height of unknown objects in the sky are impossible to make.
4. ***Remember as much as you can*** about the weather conditions and exact spot of the sighting.
5. ***If you have a camera,*** try to take a picture.
6. ***Write it all down,*** as quickly and as calmly as you can, and stick to the facts. Your impressions of what you thought you saw may be of great interest to your friends, but they will not help any investigation.
7. ***Try to get some accurate estimate*** of your own emotional state at the time of the sighting. This is difficult, but if you were drinking, or became hysterical, or had just finished reading a science-fiction story—admit it.
8. ***Send all the information*** you can to:

   PROJECT BLUE BOOK INFORMATION OFFICE
   SAFOI
   WASHINGTON, D.C. 20330

   Don't worry, you will not be jailed, put in a mental institution, ridiculed, fired or anything else. And you won't be subjected to any publicity if you don't want it.
9. ***Contact your local newspaper,*** radio, station or friendly neighborhood saucer organization if you like. There are no government restrictions against this. But do so only after you have sent a written report to the Air Force, and only if you desire publicity. Remember that many newspaper reporters and all saucer organizations have a vested interest in having every sighting turn out to be a spaceship.

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Yet the Air Force report described Zamora as "basically sincere, honest and reliable. He would not be capable of contriving a complex hoax, nor would his temperament indicate that he would have the slightest interest in such." The report ruled out hallucination and noted that Zamora is a nondrinking man. The Air Force report concludes that Zamora "saw a tangible, physical object, under good daylight illumination and from a fairly close range (at closest, almost as little as 100 feet). It appears essential that we discover what the physical object actually was . . . [and] consider this one of the major UFO sightings in the history of the Air Force's consideration of this subject. . . . It will require very possibly, the attention of the Secretary of the Air Force himself."

Commented one reporter, "Certainly such phrasing is not the stuff of which conspiracies to silence discussion are hatched."

Air Force accusers are vague about why any supposed conspiracy might have been undertaken. The most commonly given reason is that the Air Force is afraid of the panic that would sweep the country if contacts with a superior extraterrestrial civilization were made known. Accusers are also unclear on just how the Air Force, or a small group within the Air Force, has been able to operate this vast conspiracy so successfully for nearly twenty years without other branches of the government getting wind of it. Some UFO enthusiasts will privately confide that "the White House is involved."

The truth is that rather than conducting an elaborate conspiracy to cover up UFO's, the Air Force is really not very interested in UFO's at all, and hasn't been since very early in the game when there was a possibility that they might turn out to be some sort of advanced Russian aircraft or missile.

Blue Book seems to have been doing a commendable job with the resources it has at hand, but its resources are limited. Full time staff of Blue Book consists of an officer, a sergeant and a secretary at Wright-Patterson. Blue Book can call upon the services of Air Force bases in various parts of the nation to investigate sightings in their immediate areas, and when there is a particularly puzzling or well publicized sighting, Blue Book will summon Dr. Hynek.

In the past, Blue Book has also used authorities from the Weather Bureau, the Atomic Energy Commission and even agents from the FBI. But investigation has been on such a small scale that no one either among those who are convinced the saucers are spaceships or among those who are sure they are nothing out of the ordinary, has been satisfied.

A weakness of the Air Force program can be seen in what happened during the now famous "Incident at Exeter" (see Book in the News, Oct. '66). The sightings that became the basis for a best-selling

People who 'talk' to spacemen

Among the many people interested in UFO's are the "contactees," those who say they have talked to, or communicated telepathically with spacemen from flying saucers. Although, few in number, contactees receive a great deal of publicity. Who are they? H. Taylor Buckner, a social psychologist at the University of California at Berkeley, attended meetings of a contactee group for three years. His conclusions, reported in the journal *Trans-Action* are:

The members are usually old and usually widowed or single women.

Most are poor and uneducated.

"The physical health of [the members] appears to be bad, even worse than would be accounted for by the high average age.

"By any conventional definition, the mental health level of [group members] is quite low. Hallucinations are quite common, though people may be drawn to the environment by the fact that 'seeing things' is accepted as a mark of special sensitivity.

"The men . . . tend to be either young schizophrenics or aged with advanced senility. I have never seen a male saucerian who could make a successful presentation of normalcy."

Most of the members had previous involvement with occult movements. "Anyone with an occult line to sell can hook it up to flying saucers in some way and have it accepted in the flying saucer club."

Bucker gives a funny and poignant description of an attempt by the flying saucer club to form a political party:

"The founding of the Universal Party, the saucerians' very own political party, drew exactly eleven people, six of whom had set it up, four members of the 'audience,' and me. Attendance like that doesn't pay the rent."

Yet when the well publicized sightings of March, 1966, took place, a meeting of the same club filled one hall and an extra room as well.

book were investigated in a rather offhand manner by officers from the Air Base near Exeter. They were termed "fairly routine," but no explanation of what might be going on was offered to the worried citizens of the small New Hampshire town, nor was any explanation available when John Fuller published his book.

But the book interested Philip J. Klass, a senior editor of the magazine *Aviation Week & Space Technology*, and an electronics specialist. One peculariti of the Exeter sightings was that most of the saucers appeared near power lines. Fuller theorized that the spaceships were drawing power from the lines. But to Klass this suggested a more mundane explanation. Under certain conditions, corona discharge, ionized air containing electrified particles, forms along power lines. Sometimes this ionized air detaches from the lines and forms a special type of ball lightning, which dances, hovers and spins in the erratic manner ascribed to many of the Exeter UFO's. At the time of

the sightings, weather conditions around Exeter were just right for the formation of corona discharge.

Corona discharge and ball lightning are relatively uncommon occurrences and Air Force investigators simply did not have the technical knowledge to consider them as a cause of some of the puzzling sightings. If they had had the knowledge, a good deal of the resultant confusion might have been avoided.

Among saucer enthusiasts there is also the belief that the scientific community rejects, out of hand, the idea of intelligent extraterrestrial life. This is not true, in fact, scientists are more willing than most to accept this really staggering idea. In recent years, the tempo of respectable scientific discussion of this subject has increased tremendously (see "The Search For Extraterrestrial Life" Aug. '66). Space probes and powerful radio telescopes have led many scientists to the conclusion that if there is someone out there, we may be able to contact them. But it has not led to the conclusion that they are contacting us with flying saucers.

Harvard astronomer Dr. Carl Sagan is probably the most daring scientific speculator on extraterrestrial life in the U.S. today. Dr. Sagan has posed as "not implausible" the idea that the earth has been visited, not once, but many times in the past by extraterrestrials. Yet Dr. Sagan was a member of the *ad hoc* committee that unanimously concluded that there was no evidence that the UFO's are spaceships. He told a CBS television show on UFO's: "If you would believe, as the flying saucer cultists would have us believe, that the majority of the saucer reports are due to their [extraterrestrial] visitations, then you have a very strange situation. That means that several spaceships are coming to earth over interstellar distances every day, as if all the anthropologists in the world were to converge on one of the Andaman Islands in the Indian Ocean because they invented the fish net there or something."

In a new book, "Intelligent Life in the Universe," written in collaboration with Dr. I. S. Shklovskii, Russia's farthest-out thinker on the subject, Dr. Sagan says: "Repeated sightings of UFO's, and the persistence of the United States Air Force and members of the responsible scientific community in explaining the sightings away have suggested to some that a conspiracy exists to conceal from the public the true nature of the UFO's. But precisely because people desire so intensely that unidentified flying objects be of benign, intelligent and extraterrestrial origin, honesty requires that in evaluating the observations, we accept only the most rigorous logic and the most convincing evidence."

If we lay aside the Air Force conspiracy theory, and the myth that scientists refuse to consider extraterrestrial life, then the case for the other worldly origin of flying saucers becomes very much weaker. We are then confronted

UPI

These men are supposed to be looking at two UFO's, but the angle of their heads shows they are not looking high enough. Shadows are left on one UFO and right on the other, a physical impossibility.

with the fact that elaborate and sophisticated radar and space tracking networks have never detected a single spaceship, much less great numbers of them. We must also realize that when given the facts, and the time to evaluate them, scientists have been able to come up with natural explanations for all but a small percentage of the sightings.

Another source of confusion is that the use of the term flying saucer—or even Unidentified Flying Object—gives the impression that a single type of object is being sighted. This is not the case at all. Descriptions of UFO's vary wildly.

The question would be finally settled if a flying saucer landed on the White House lawn and out stepped a crew of little men demanding to be taken to our leader. But after nearly twenty years this seems unlikely, either because there are no spaceships or if there are, the spacemen are playing it coy for obscure reasons of their own.

Most stories of actual contact with a flying saucer or its crew are of dubious value and add little to the serious study of the phenomena. The well publicized case of Betty and Barny Hill, the Portsmouth N.H. couple who revealed under hypnosis that they had been taken aboard a flying saucer, is bizarre and interesting, but completely without supporting evidence. Says Dr. Hynek, "It's in the hands of the psychiatrists. I'm glad I don't have to get involved with it."

But the vast majority of people who see UFO's are not lying, exaggerating or suffering from abnormal mental conditions. They are seeing something. What they are seeing are usually quite ordinary things under unusual conditions. Yet there is still that tantalizing core of sightings that are "unexplained," Dr. Hynek's "brain teasers."

The possibility that they will turn out to be spaceships is remote, but it cannot be discounted. Failing this, the investigation may discover some new and unknown natural phenomenon that has been stimulating some of the sightings.

In any event, the University of Colorado investigation should help clear the air of the clouds of suspicion, fear and rumor that have enveloped the subject of UFO's for twenty years.

Cure for hangovers

With the approaching year-end party season, Science Digest offers a two-part report for moderate drinkers who may have "one too many."

A new pill

by Jeanne Reinert

If an Englishman can buy an antihangover pill, why can't you? In a few months, you probably can. The pill is big and bright pink. It has the comforting name "Soba." In England, a vial of four costs three shillings and sixpence, or 49 cents.

Howard Rice, director of Laurice of London, which makes the pill, says it has been on the market in Great Britain since June and "has been welcomed by many."

An AP report by Eddy Gilmore from London gives a consumer's reaction:

"In about 15 minutes, the end of the world seemed less imminent. . . . The little man with the hammer stopped his violent pounding inside the skull. . . . The brown, furry taste in the mouth tasted less brown and furry . . . and the cat moving across the carpet ceased stomping."

Laurice of London says the pill has been clinically tested on 1,000 men and women, all suffering from hangovers.

The English version of the F.D.A., the advisory Dunlop Committee on Safety of Drugs, tested Soba for any possible side effects. None was reported, and the pill was passed for sale and consumption. Soba is now before the F.D.A. for approval.

Alas, before your hopes are raised too high for a clear mind and cheery outlook after an evening of fun, perhaps an analysis of the contents is in order.

Soba consists of five active ingredients:

Aneurine hydrochloride	40 mg.
Riboflavin	10 mg.
Nicotinamide	100 mg.
Pyridoxine	20 mg.
Caffeine citrate	200 mg.

But what will they do? Well,

Aneurine hydrochloride is another name for Thiamine or B_1. It aids carbohydrate metabolism and nerve function. That dosage is slightly more than the "usual therapeutic dosage" recommended in the *Merck Manual* of 5 - 30 milligrams.

Riboflavin is Vitamin B_2. It promotes growth and is essential to cellular oxidation; 10 - 30 mg. is a usual dosage.

Nicotinamide is another member of the Vitamin B complex. It helps transfer oxygen in oxidations concerned with life processes in the cells. It also dilates blood vessels. Between 100 and 1,000 mg. is a typical dosage.

Pyridoxine is critical for cellular function and for metabolism of certain amino and fatty acids. Therapeutic dosage is 25 - 100 mg. a day.

Caffeine citrate is a strong dose of caffeine, equal to about two cups of coffee.

In essence, Soba is a healthy dose of vitamin B complex plus some wakeup action.

Can that combination cure a hangover? Let's trace a hangover from its beginning.

How hangovers start

Alcohol metabolizes almost immediately. It can be detected in the bloodstream five minutes after someone downs a tot. One obvious effect of alcohol is to dilate the blood vessels; this increases the supply of oxygen to the brain. One theory is that the brain literally hurts from too much oxygen. However, there are additional factors in a hangover. Among them are poisons called congeners (see page 66).

Dr. Joseph D. Wassersug, a *Science Digest* medical writer, points out that studies on the hearts of dogs also have shown some toxic effects of alcohol. He says alcohol could be described as a "mildly toxic drug" that may damage nerve cells.

Vitamin B panacea?

It's a bit of "modern folklore" that a shot of B vitamins before a drink forestalls a hangover, says Samuel Mines, spokesman for Pfizer International Inc.

The rationale is that alcohol damages the liver and vitamin B complex helps the liver. Hopefully, these effects offset each other. However, Dr. Wassersug says that good nutrition will not protect an alcoholic from an early death.

What about the effect of vitamin B complex in cases of simple hangover in ordinarily moderate drinkers?

One apparent problem with Soba is alcohol's immediate effect compared with the fairly slow effect of vitamins. Vitamins are not absorbed until they reach the intestinal tract, literally hours later. Only then can they be utilized, a process which takes additional time.

Another ingredient of the pill—caffeine—of course, stimulates the system. For some people, this offsets the depressant effects that fol-

low excessive drinking. Jerome Greer of Upjohn says the definition of a drunk after several cups of coffee is "a wide-awake drunk."

Greer, openly skeptical of Soba as a hangover cure, says, "I wouldn't say it is of no value, but I could recommend any number of therapeutic vitamins. The formula is a vitamin formula with caffeine. Many, many such vitamin formulations are on the market and none makes such a claim. There must be a reason they don't make such a claim."

It would seem that Soba's therapeutic effects are partial and that it's not a magical cure.

Other hangover treatments for which there is some medical basis include:

1. Breathing pure oxygen, although this obviously conflicts with the theory that too much oxygen causes the hangover headache.
2. Going to bed with a sedative, perhaps a barbiturate. This remedy keeps the patient out of harm's way.
3. Taking a tranquilizer such as Miltown plus an aspirin.
4. Downing a couple of aspirins, an old-fashioned remedy of many years' standing.
5. Taking a tapering-off dose of alcohol such as a "Bloody Mary."

The discomfort that follows heavy drinking may not stem from the alcohol so much as from toxic substances. See the article that follows.

'It's the poison'

by Duane Valentry

WHEN people buy a bottle of gin, vodka or whiskey, they find nothing on the label about "congeners."

These mystery ingredients of a liquid many people drink as often as milk have managed to stay out of the public eye if not its stomach.

But congeners are what *else* is in the bottle besides alcohol and water. Since they are directly connected with you and your hangover, it has often been suggested that manufacturers could do more to solve this national headache.

Congeners, which were first studied in 1895 by scientists Jeffrey and Serveaux, and in 1943 by Haggard, Greenberg and Cohen, lend color and aroma to liquor. They also supply the drum that beats in the head. In fact, a high incidence of congeners provides "a somewhat toxic beverage," says one scientist.

"This is not surprising, since many of the congeners are highly poisonous substances. The toxic effects of congeners are exaggerated by the slowing down of the rate of metabolism by alcohol, which thereby enhances undesirable side effects of congeners. Most contemporary investigators agree that beverages with a high congener content when contrasted with those with a low content, affect adversely the rate of alcohol disappearance from the body."

This means a slower rate of recovery from intoxication, more severe hangover effects, diminished motor response, poorer judgment and decrease of learned skills.

Estimates place the number of congeners in liquor in the hundreds. Of these, seven have been isolated for analysis: fusel oil, total acids (acetic acid), esters (ethyl acetate), aldehydes (acetaldehyde), furfural, tannins and total solids.

Oddly enough, it is fine aged whiskey, owing its color, flavor and bouquet to congeners, that can set the drinker up for a really bad morning after.

Congener's make-up

The why of this is apparent when taking a look at a congener's make-up of volatile and nonvolatile components. The volatile ones come mainly from the grain, secondarily from the fermentation and aging process. The nonvolatile fraction is made up of the tannins drawn from the wood during aging, along with many other materials, so that a long aging process in the barrel actually increases the percentage of congeners.

According to researchers Damrau and Liddy, that "explains why mellow, old whiskey, which is loaded with congeners, may go down with the utmost of smoothness, but the effect lingers longer than that of a younger brew. These substances slow the rate at which alcohol passes into the blood-stream. You feel the effects more slowly, but experience them for a longer period of time."

A still closer look at the nature of these seven isolated congeners explains much about the hangover and its horrors.

Fusel oil: "An oily, colorless organic liquid with an unpleasant odor and taste, used as a solvent in the production of certain enamels and lacquers—a mixture of butyl and isoamyl alcohols and other organic substances. A by-product of the distillation of alcohol produced by fermentation."

Acetic acid (total acids): "A weak, organic acid—the chief constituent of vinegar—obtained by the action of bacteria on dilute ethyl alcohol and commercially prepared from acetylene or by the destructive distillation of wood. Acetic acid reacts with other chemicals to form lead, potassium acetates, used widely in medicine; cellulose acetate used in making nonflammable movie film."

Aldehydes: "Group of organic compounds containing a carbon-hydrogen-oxygen group—colorless, volatile liquids used widely in industry, in manufacture of plastics, dyes, drugs."

Esters: "Group of sweet-smelling organic compounds formed by reaction between an acid and alcohol. Esters have important applications in industry—used in solvents, flavoring for perfume, manufacture of explosives, paints."

Furfural: "An oily liquid of pleasant odor, obtained by distillation of bran, wood, etc., used in making lacquers, dyes."

Tannins: "A strongly astringent substance obtained in scales from gallnuts, sumac, etc. used in tanning, dyeing, medicine."

Definitions: *Webster and Encyclopedia of the Sciences (Popular Science/Doubleday)*

Good whiskeys worse

"Cognac, bonded liquor and aged whiskey—the more costly, sought-after beverages—are higher in congener content than the cheaper, younger, blended whiskeys," say the experts. "None of the congeners is present in large amounts; most exist only in trace amounts; the total rarely exceeds 0.5 percent of the beverage by weight."

Some of those analyzing liquor-content claim that vodka contains only 1/10th the number of congeners found in rum and whiskey. Although Damrau, in a study of alcoholics, has stated that such a low congener beverage as vodka does not appeal to the alcoholic's taste, others now making such studies disagree.

"Our patients do not sip or flavor their drinks, they drink for the effect," cites one of these observers. "Although whiskey may be the preferred beverage (as it is for 80 percent of American drinkers, social and immoderate), alcoholics will not refuse alternate beverage if whiskey is unavailable. Further, alcoholics in their attempts to control their drinking frequently switch brands and types of beverage."

"The physiologic studies already cited demonstrate that control of congeners, as achieved through manufacturing and blending techniques which regulate their type and quantity, can lead to either an increase or a decrease in toxic effects. For the consumer, the latter is certainly more desirable, physically and perhaps, psychologically."

Researchers McKennis and Hagg add that since congener content can be materially influenced "by altering the distillation and aging process (as has been done with vodka-type whiskey by a filtering process over heavy charcoal), we feel that every effort should be expended by research in the alcohol industry for their removal."

Hangover protection

They suggest that along with the filtration method already used to remove congeners in vodka production, bottlers maintain the smell, taste and appearance of the different types of beverages by use of non-toxic flavoring, coloring and aromatic substances.

"It may well be that the social drinker in his infinite subconscious wisdom has already switched to the increased use of those beverages with relatively low congener content, vodka and dry gins," one scientist points out.

It may be only a matter of time until that bottle you buy is guaranteed by the scientists to have the sting removed and labeled, "Hangover-proof."

Ice melts away from 10,000-year-old core of gravelly soil recovered from the bottom of the mile-long hole drilled in Greenland Ice Sheet; it should reveal clues about Earth.

Frozen 10,000 years ago

A LAYER-CAKE of history, frozen 10,000 years ago, is having its stratified "profile" exposed by a team of Army scientists.

On the polar ice cap 140 miles off Greenland's northwest coast, scientists from the Army's Material Command's Cold Regions Research and Engineering Laboratory (USA—CRREL) have drilled a mile-deep hole into the ice.

The research program, which is expected to reveal some important information about the earth's geological evolution, is being conducted by agreement with the Danish government.

How does one go about penetrating 10,000 years' buildup of ice? The Army's solution is a thermal drill with an electrically heated hollow drill head which literally melts its way through the ice.

Penetrating some 4562 feet, the geologists have dredged up samples of sand, gravel and stones from different strata along the way.

B. Lyle Hansen, head of the program since its inception in 1961, says the frozen materials (including ice cores recovered from the drilling) should indicate climatological factors such as changes in precipitation and temperature, composition of the air throughout the ice, salt nuclei content, dustiness of the atmosphere and frequency of major volcanic eruptions.

Inspection of the materials will be directed by Dr. Chester C. Langway, Jr., geologist-glaciologist for CRREL.

People alarmed by rising crime rates tend to blame everyone and everything else. But many social scientists feel that the seeds of crime are planted by the "good" people.

Crime—are you guilty?

by Bruce Frisch

THE seeds of crime were brought to America on the Mayflower. From them has grown the biggest crime problem in the world. "Crime in America as a whole is in a class of its own. Not only is there more of it, but some of its forms are incomparably graver," says Leon Radzinowicz of the Institute of Criminology at the U. of Cambridge, England.

The roots of crime are nourished by the things we say we believe in most, the "heritage of our forefathers," and the "American way of life." This finding of sociology, not wrist radios or computers, is the secret weapon with which science can cure and prevent crime.

The Puritans are involved because they brought with them a strict moral code. "Captain Kimble of Boston was put in the stocks for two hours for his 'lewd and unseemly' behavior, in the language of the court, for 'publiquely' kissing his wife on the doorstep of his house upon his return on the Sabbath day from a three-year sea voyage," reports Lois Merrill in her book, *The Puritan Policeman*. The authoritarian Puritans came here as rebels against authority in England. The combination of a hard-nosed moral code and saying that only jerks follow it has plagued the nation ever since.

Ours is a "delinquent society," says Milton Barron of Cornell U. Its official code is in Fourth of July speeches, he says, in election platforms, sermons and what parents, schools and the Boy Scouts tell children. The unofficial code is contained in casual conversation and real behavior. Compare the codes, and you will find "a great gulf between precept and practice," says Donald Taft, professor of sociology, emeritus, from the U. of Illinois.

Success is the goal of Americans. The proof of success is material goods. Often, money and possessions become ends in themselves. How the goods are obtained is not

F.B.I. chart

The Crime Clock

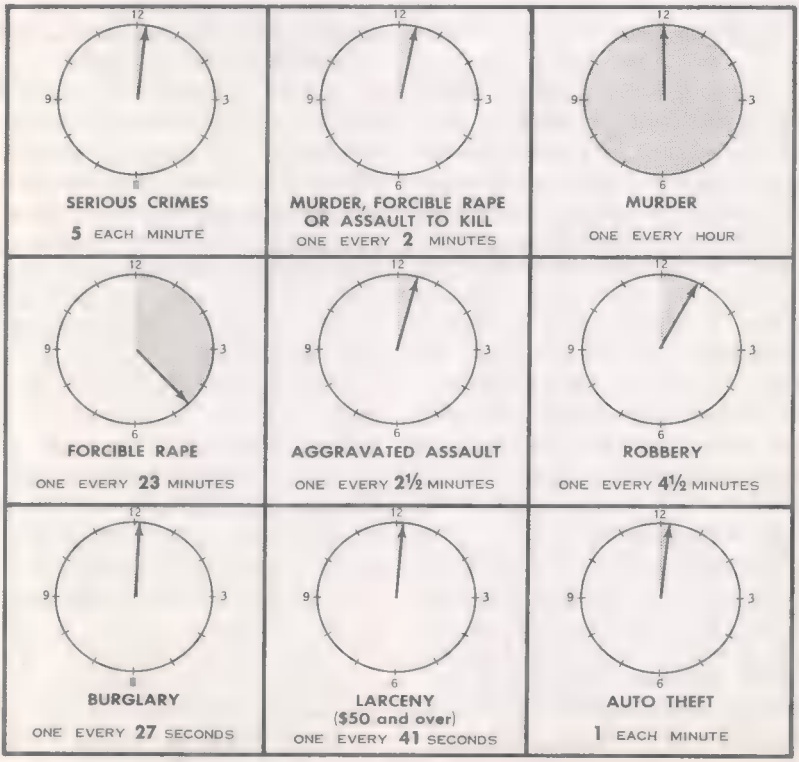
Five serious crimes are committed in the U.S. every minute. Are the roots of violence deep in the American way of life?

too important, that they be obtained is all important.

Not every one is equipped for success. Some that are, though told that in our democratic society all are given an equal try, find that they are disqualified because of race, religion or nationality. Although we are the "richest nation of the world (with more desires satisfied)," says Taft, "we may be called the most starved nation (with more desires unsatisfied)."

For some, the appearance of success will do almost as well as the real thing. For 750,000 others, there is escape from failure in alcoholism. For perhaps 42,500 more, escape is in drug addiction. Many failures collect in the slums, where they create an atmosphere in which more of their children take a shortcut to success in crime.

We make the taking easy. We laugh at Casper Milquetoast who obeys all the rules. We cheer the rebel who breaks them. It has become a quasi-religious and patriotic duty among Americans to resist restraints placed upon free adventuring, says Barron. In addition, the violent history of the opening



the western frontier passed on the notion that respectable groups can use violence or mob action.

Even the unofficial rules are not dependable constants. Every section, neighborhood, race, nationality, profession, gang, club and class has its own set in conflict with official code and the codes of the other groups. One man can belong to several at once and switch from one to the other as the churning American society moves him from place to place and class to class. Thus, crime is an index of change and (if one likes the change) of progress, Taft points out.

Official pay-off

Though the Puritan code differs from actual behavior, we have written it into law. As a result, desires for sex, drugs, gambling and abortions cannot be legally satisfied. So are born the rackets. They are businesses, a service industry. Like dry cleaners, they cannot operate without the cooperation of the officials. Soon the police captain, the judge, the mayor or the governor are in on the take. The patrons as well as the paid off are often the very best people. Our prestige classes set the styles in crime, as they do in fashion.

The family and the church, which might set opposing examples, are tainted by their ties with the system. The family further loses influence over its members as impersonal outside agencies take over entertainment, education, laundering, shelter and feeding.

Some churches are exclusive, race- or class-conscious. From the Protestant churches come both the official moral code and the middle class that set the contrasting patterns of actual behavior.

"A vast amount of crime of a nonsexual nature is rooted in personal sex frustration, the loss of social status because the sex code is violated, an inculture conflict produced by varying group standards and patterns of sex behavior," says Taft. Church attitudes, he continues, compound the problem.

Perhaps the greatest contribution of the church to crime, Taft believes, is its insistence on free will.

From medieval church concepts of eternal punishment, atonement and conversion stemmed a companion concept that man can guide his actions. A criminal chooses to do wrong, so is responsible for his act and must be punished, runs the logic of free will. With exceptions made for the insane, the young and special circumstances, the principle still dominates our legal system.

The criminologist, however, draws from the above description of our culture the conclusion that the criminal is a *product* of our society. We get the criminals we deserve. There is little room for free choice in this theory of "determinism."

From this viewpoint, enforcement wars on crime are minor scuffles. Enforcement can offer only a little protection, a little deterrence.

When a sample of youths was asked to name in confidence the

A white-collar criminal is scarcely punished by society

offenses they had committed among 22 listed, it was discovered that nine out of ten "crimes" had never been detected.

And once crimes are reported, how many are solved? In a typical year covered by the Justice Department's Uniform Crime Reports, in robberies reported, arrest resulted one out of three times; among auto thefts, one out of five.

Next, not all persons apprehended are brought to trial. In one six-month period, detectives of four stores in the Chicago Loop caught 1,576 persons thieving. Only 137 were charged in court.

The rarity who ends up in jail must be unlucky or stupid—or come from the wrong side of the tracks. A map of high-delinquency areas, says Barron, could also be a map of areas where parents don't have the influence or money to keep delinquent acts of their children off the record. In reverse, the map could be a chart of white-collar crime, "a crime committed by a person of respectability and high social status in the course of his occupation."

A convicted white-collar criminal is excused by his friends and scarcely punished by society. Perhaps he will get a cease and desist order from the Federal Trade Commission. We don't warn the burglar to desist, Taft notes. But then, men of the burglar class do not man the courts or own the newspapers, he points out.

Crime rates are high among the weak, says Austin Turk, assistant professor of sociology at Indiana U. Doesn't this mean that the real subject of criminology should be the possibility that the more powerful use the legal system to label the less powerful as criminals, whatever their behavior?

Who, then, are the highly select prisoners? The average citizen thinks that jails are inhabited by thieves and prisons by murderers, rapists and kidnapers, says James Bennet, director of the U. S. Bureau of Prisons. In reality, more than half those in jails are drunks and vagrants. Two-thirds of those sent to prison are there for minor crimes, burglary, larceny, forgery and auto theft. Fewer than 10 percent have committed homicide, rape or kidnaping. "Defeated men, overcome with apathy," Taft calls them.

We can now consider F.B.I. figures showing that crime in the U.S. is rising six times faster than population growth with a new perspective. The figure is also probably high. Just one of the criticisms made is that the large number of war babies are now between 15 and 24, the age span that accounts for 70 percent of crime. However, says Taft, "with full allowance for exaggeration due to popular fears, criminology deals with a real, and

seemingly increasing, national danger."

But arrest comes too late. The damage to the criminal has been done long before. How long before was uncovered by a landmark study by Sheldon and Eleanor Glueck of the Harvard Law School. They matched 500 delinquent boys against 500 nondelinquent boys in underprivileged neighborhoods of the Boston area by age, race and general intelligence. They and their staff studied the boys' families and personal backgrounds and use of leisure, classified the boys as pudgy endomorphs, athletic mesomorphs or stringbean ectomorphs and gave them physical exams and IQ tests. The boys' emotional makeups were probed by Rorschach ink blot tests and by interviews with a psychiatrist. The Gluecks followed the boys' careers from 1940 to 1948 and are still sifting the data.

They found that more than 80 percent of the delinquents had criminals in their families. Often a delinquent's father had divorced or deserted the boy's mother. When the father was present, he was less likely to be a suitable hero-ideal.

One out of three of the young delinquents had moved eleven or more times.

Although both groups fell mostly in the average range of intelligence, delinquents were better at direct physical relationships and worse at symbolic or abstract thinking. For this and other reasons, they did badly when they got to school. More were left back repeatedly. They didn't get along with their schoolmates and shunned socially-approved recreation. Instead, over half joined gangs.

There the delinquent found many

Are criminals born?

An intriguing sidelight to the Gluecks' monumental study is its revival of the notion of the born criminal. Modern criminology started with this theory. C. Lombroso, its founder, was an Italian army doctor who was struck by the frequency and indecency of tattoos on "vicious," compared with "honest" soldiers. From there he went on to a theory that criminals were physical throwbacks to primitive man, and even animals. It was to escape such pseudo-scientific nonsense that Americans broke away from European criminology after World War I.

The Gluecks found that twice as many mesomorphs (boys with an athletic body type) were delinquents as nondelinquents (60.1 percent vs. 30.7 percent). Only half as many ectomorphs (boys with a stringbean body type) were delinquents as nondelinquents (14.4 percent vs. 39.6 percent). This fits in with the Gluecks' fascination with how two boys in practically identical circumstances can veer in opposite directions. Thus, the body one is born with seems to affect how emotional traits and the pressures of home life will be expressed in action.

Delinquents begin antisocial acts at the average age of eight

of the things he had missed. "Some of the gang boy's drives, especially perhaps the drive for social recognition, reflects the almost universal fact that Americans must at all costs belong and must strive for social recognition," says Taft. The boy's strong gang loyalty "is not only not considered a vice, it is taught as a virtue in schools and from the pulpit." But "loyalty based on nothing but the 'stand-by-your-bunch' principle is fickle and may be transferred from an approved to a disapproved group."

The healthy family, according to Taft, conditions the child so that it hurts him to hurt others. When the family hasn't instilled its standards, the gang can impose its own.

The Gluecks' study showed that the friends delinquents chose were almost always other delinquents and were often older boys, perhaps, the Gluecks surmise, as substitute hero-ideals for their fathers.

Underneath, the delinquents were extroverted and vivacious, and were less conventional, conformist and dependent, those traits we so belittle that characterized many nondelinquents. In general, the socially unhealthy delinquents were less neurotic than the nondelinquents. "The typical gang boy is, in his basic personality traits, a typical American boy," says Taft. Except, of course, that he is also more often cruel, less self-controlled, destructive, hostile, defiant, stubborn, aggressive and suspicious. He appears in court for the first time at 12.4 years on the average.

But by the time "the law at last takes hold, the antisocial attitudes and habits, and the personality and character distortions are far deeper than the delinquent act itself would indicate," say the Gluecks. The average age of onset of antisocial behavior was 8.3 years. Eighteen percent markedly misbehaved in kindergarten or first grade.

The damage is done so early that when a child is between 5½ and 6½ years old, it can be foretold whether or not he will be a delinquent.

Out of their mountain of data, the Gluecks constructed three prediction tables based on the Rorschach test, psychiatric interviews and family life. Because the first two require so much expert staff, the social scale has become the principal one. In two long-range tests of the scale in New York and Washington, its five factors were reduced to three: supervision of boy by mother, family cohesiveness and discipline of boy by father. The last factor was changed to discipline by mother, because so often there was no father present.

Predictions in Washington were 81 percent correct for delinquents, 95 percent correct for nondelinquents. All those given an even

chance by the social scale were put into one category or the other by applying the other two tables.

The conclusion the Gluecks draw is that children should be spotted as potential delinquents with the prediction tables, then their home life corrected by a family clinic.

Multifactor outlook

Psychiatrists, much more than the Gluecks, place the blame for criminality almost completely on the early parent-child relationship. Sociologists accept the importance of the family but stress the influence of groups outside the family. Fortunately, American sociologists are willing to incorporate proven points from any scientific specialty in their "multifactor" outlook. No one theory can explain both running stop-lights and raping women, says Taft.

It is at groups that most preventive programs are aimed. Some programs try to restore to the neighborhood some of its lost influence over its members. Some seek out gangs and try to steer their rebellious drives into harmless channels. But if, as "according to leading American criminologists, crime is deeply imbedded in the very texture of American society," asks Radzinowicz, how much impact can a local project have?

Powerful new forces almost beyond our control do indeed make our efforts look feeble. Tides of Negroes and hill people sweeping from the South to the North; easterners trekking west; people moving from the country to the city and from the city to the suburb are cited as swelling crime. Looser sex standards, acceptance of unions, less prejudice against races and cultures are counted as lowering crime.

"Special interests, prejudices," say the Gluecks, resist many basic changes in our culture. Other features of our society that add to crime—democracy, freedom, bubbling change—we wouldn't care to alter if we could.

The nearest thing to a crimeless nation would be a country of peasants. Is that what we want? Or will we have to accept a high rate of crime in the kind of country we apparently desire?

Group treatment

The second front in the real war on crime is in the prisons. Here the idea that the criminal is a product leads to a New Penology in which prison is thought of as a place for treatment. Criminologists are impressed by Alcoholics Anonymous and the newer Synanon houses for drug addicts, so treatment would be through groups. The length of treatment and thus the prison term would be based on an estimate of future dangerousness rather than on vengeance.

For instance, says Taft, "Typical murderers . . . are rarely dangerous in the sense of being likely to repeat their acts. Murder usually results from stresses and strains which are not often repeating in the life of a

In the New Penology, prison is a place for treatment

criminal, even though his personality remains unchanged."

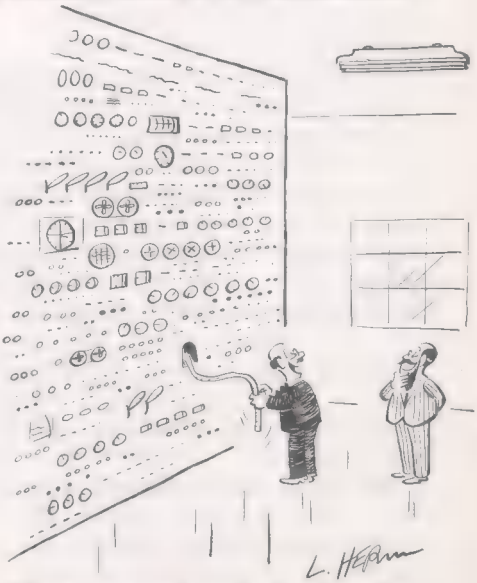
When Alred Schnur of the School of Police Administration and Public Safety at the U. of Michigan totalled up all the rehabilitation staffs in federal and state prisons, he found that half the prisoners would get less than 30 hours training before getting out. Rehabilitation must be a "do-it-yourself project," he said, and concluded that the New Penology was still more theory than practice.

As we largely mark time, holding the conclusions of science at arm's length, the moving target of crime shifts position. The old criminal, the delinquent who learned from the neighborhood criminal hierarchy all the skills of a trade such as safecracking, is on the way out, claim John Irwin of the U. of California and Lewis Yablonsky, professor of sociology at San Fernando Valley State College, California. The old criminal is after money. When he uses violence, it is just as a means to that end. He has a well-developed rationale, and because he needs the help of many specialists, a strict code based on "don't squeal."

Today, a higher rate of social change is turning the stable slum that developed him into a disorganized slum that breeds the new criminal.

The model new criminal is in a violent gang. Although "gang fights are for kids," he uses violence for the immediate emotional gratification of kicks and to gain status. Impulsively he picks an unknown victim without really anticipating the killing that often results. He has no code. The new criminal is often an addict who will give up his partner for a fix.

Even for this senseless killer there is hope. The lesson of determinism is optimistic: Crime is caused, so can be cured. Even for this murderer we can have compassion. A Taft corollary to the lesson is: "We don't have to hate people any more."



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10. And the form for *that* will be no prettier.

I prescribe . . .

. . . for high blood pressure

by Joseph D. Wassersug, M.D.

WHY treat high blood pressure at all? The answer is simply this:

Many persons whose pressure is above average die or are disabled by the consequences of the increased pressure much earlier in life than the average person. For most people, high blood pressure kills or cripples prematurely and increases the likelihood of damage to the heart, brain and eyes. Strokes, heart attacks and blindness occur more frequently in these cases.

With modern medical treatment, high blood pressure can usually be lowered to normal levels and life prolonged.

Most cases of high blood pressure are considered "medical." There are also four important types that are "surgical," in which real cure is possible if the surgical cause is found and corrected.

In treating cases medically, I prescribe many things for high blood pressure, only some of which are medicine.

For some persons, high blood pressure is apparently a direct consequence of obesity. I insist on a weight reduction program for the overweight patient because I have learned from experience that no medicine works so long as the patient remains fat. To load the patient up with a lot of pills and allow him to remain fat is stupid. I try not to be stupid. I urge, advise, cajole and browbeat my patients to get them to remove excess fat.

Weight reduction, by itself, however, is effective only in a rather small percentage of patients, since it is possible to have high blood pressure without being fat. A somewhat similar situation exists regarding "nerves" and "nervousness." You can have high blood pressure without being nervous and you can

be nervous without having high blood pressure. A neurotic may or may not have high blood pressure; the pressure patient may or may not be neurotic. If the patient needs help for his nerves, I try to help him in whatever way I can—advice, insight and medicine.

Once the problems of obesity and nervousness are settled, I can start writing prescriptions. What do I prescribe?

Snake-root drugs

First, I might consider one of the many *rauwolfia* drugs. These are derived from the Indian snake-root plant, and they have the favorable properties of lowering the pressure, slowing the pulse and relieving anxiety. Their side effects, which include nasal stuffiness, intestinal irritation, "goose-pimples" and mental depression, may be annoying to some patients and thus limit their usefulness. When the results are good and the side-effects are mild, I may try several different rauwolfia drugs, hoping to find the one that is most useful and least annoying. Since the rauwolfias are mild drugs, they may not be effective when the pressure is really high. I do not persist in ordering rauwolfias when they don't work and I discontinue them if their side-effects are too annoying.

Sometimes my first choice is a *thiazide* drug. I will choose thiazide if the patient also has swollen ankles and complains of shortness of breath. The chief advantage of the thiazides is that they drive the salt *sodium* out of the body. Once the salt goes, the excess water in the ankles (swollen ankles) and in the lungs (shortness of breath) go with it. Restricting the patient's intake of salt and salty foods is a good idea. Most people eat far more salt than they need anyhow.

With thiazides, there also may be problems. Sometimes—they drive out too much *potassium* as well as *sodium*. Since muscles (including heart muscle) need potassium for proper function, depletion of potassium can make the patient feel weak. Furthermore, thiazides may temporarily and inexplicably induce a gouty or diabetic-like condition in certain subjects. They may also cause a rash or make a patient's skin more sensitive to sunlight. The patient on thiazides needs to be checked from time to time to be sure that there are no complications.

Several drug manufacturers provide doctors with tablets that contain rauwolfia and thiazide drugs; some also add other ingredients. I commonly use the combinations of these two drugs because they seem to enhance the effectiveness of each other and reduce the incidence of side effects. I am reluctant to use 3-in-1 or 4-in-1 combinations because the pre-set dosages limit my versatility. I like to add and subtract what I think the patient needs and not be restricted by the arbitrary and rigid combinations established by the pill makers. Sometimes I'm real ornery about this.

Effective drugs like aldomet are good medicines, not panaceas.

One valuable drug, *hydralazine*, can be used by itself or in combinations (see above). Hydralazine seems able to act directly on blood vessels and make them relax. When the drug first came out, I used it a lot more than I do now. An increasing number of reports in medical literature indicated that hydralazine caused a potentially serious lupus-like condition and these adverse findings dampened my enthusiasm. Now I use *hydralazine* sparingly, cautiously and only when the safer drugs prove ineffectual.

One medicine that I use fairly frequently nowadays had taken over thirty years to get from the brains of the scientists into the bottles of the druggists. In 1932, when I was a student in college doing research on cancer, one chemical that I used experimentally was DOPA (dihydroxyphenylalanine). We knew even then that it had some striking properties because it was a precursor to *epinephrine* (adrenalin), which was a potent natural compound that raised blood pressure.

Gradually, chemists learned how to create an antagonist and inhibitor of DOPA. This they called alpha-methyl-dopa (*aldomet*), and only after it was proved safe and effective in animals and in humans was it marketed. Yet I do not find it helpful in all patients. When it works, it works well, but it doesn't work often enough. After thirty years of research, it is a good medicine, not a panacea.

How to treat those few cases that may be surgical? There are four main surgical types: (1) one-sided renal (kidney) artery disease, (2) pheochromocytoma, (3) aldosteronism, and (4) stricture (coarctation) of the aorta. In most of these cases, it is best to have the patient hospitalized so that appropriate tests can be carried out.

A *pheochromocytoma* is an abnormal tiny knot of tissue (or tumor) almost anywhere in the body that secretes an excess amount of epinephrine which in turn raises the pressure. Sometimes its presence can be indirectly detected by a careful search of the urine for chemical compounds related to epinephrine. Its action can be also temporarily blocked by injecting in the patient a chemical, *phentolamine*. During the injection, frequent pressure readings are taken to determine how much the pressure has dropped. If the patient is examined in between his bouts of high blood pressure, he can be given an injection of *histamine* to stimulate epinephrine secretion. High blood pressure occurs as a result of this test only if a *pheochromocytoma* is a resident condition in the patient. Since there may be some hazard to these tests, I prefer to do them in

a hospital and not in my office.

Aldosteronism is a rare and rather newly discovered cause of high blood pressure. Aldosterone is a chemical that increases salt (sodium) retention in the body and raises blood pressure through a most complicated chemical derangement. Most often, the problem is located in one (or both) of the adrenal glands. In some cases, the patient also has diabetes. A tiny nubbin of aldosterone-secreting tissue no larger than a pea can cause disability and death from high blood pressure; its early surgical removal can be life-saving.

To detect unilateral disease of a renal artery requires not only intricate X-ray examinations and chemical tests but even some of the most sophisticated electronic gadgetry. Unfortunately, however, even when some disease or obstruction in an artery is discovered it may not be curable surgically. The best that the doctor can do is to make the appropriate tests and then try to make a wise decision when all the facts are before him.

Narrowing of aorta

When high pressure occurs in a child or young adult it is often caused by a kinking or a narrowing (coarctation) of the aorta (the large artery leading from the heart). A careful physical examination usually provides the initial clues that the doctor needs. X rays of the chest may show characteristic "nothing" of the undersurface of the ribs. There are many cases on record now of operative cure of coarctation of the aorta, with permanent relief of the patient's high blood pressure.

If my list of blood pressure remedies already seems complicated and involved, I must admit that it is still far from complete.

Agents to drop pressure

There remain the problem cases for whom none of the usual medicines are effective. There are those patients whose blood pressure is due to chronically infected kidneys or to kidney malformations that are inoperable. There are many others whose pressure keeps going up for no explicable reason. We must try to help them, too.

Among the truly potent antihypertension drugs are *guanethidine, pargyline, veratrum alkaloids* and *nerve-blocking agents*. Although these chemicals are all different and act on different sites in the body, they all share the ability of dropping the pressure to such an extent, that, if not carefully controlled, they can actually make a person faint. Such fainting is often referred to as *postural hypotension*.

Doctors who use these remedies are cautioned to check their patients' blood pressure in the *standing* position to make sure that the standing pressure is at a reasonably safe level. Whenever I use these drugs I check the pressure several

Blood pressure that's too high at 35 may be quite normal at 75.

times in both the sitting and standing positions.

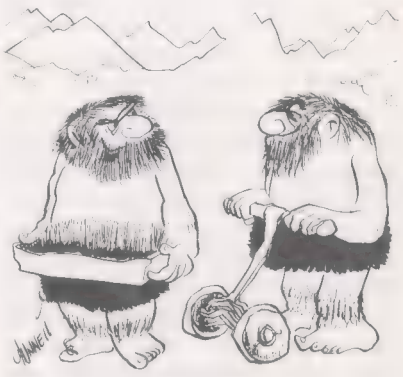
Our list of therapies is still incomplete. Some years ago, after Miltown was discovered, the manufacturer of the drug took upon himself the task of elaborating chemical cousins of Miltown that might have other valuable effects. One such bit of chemical synthesis resulted in a compound called *mebutamate*. It was claimed to be less sedative and more effective than Miltown in lowering *mild* pressure. My own experience leads me to believe that mebutamate is almost as good as Miltown both as a sedative and a blood pressure remedy.

I do *not* prescribe for *every* case of high blood pressure. If a person is old and has lived long beyond the average life expectancy for his age, then the "high" blood pressure is really not a disease for that person since it hasn't shortened life or created any disability. Why treat him, then, I ask? Furthermore, blood pressure tends to increase with age; what is "high" at 35 or 40 may be normal at 75 or 80.

On the other hand, in some cases, I make a most intensive effort not only to "treat" the pressure but to search out its cause in the expectation that the patient might be cured.

In selecting cases for intensive investigation and additional hospital study, I usually exclude the elderly and those patients who respond quickly and persistently to simple high blood pressure remedies. On the other hand, I would include for detailed studies those persons on whom I must use the most potent (and possibly dangerous) drugs, those whose blood pressure may be intermittent and whose pressure peaks may be accompanied by palpitation, perspiration and a sense of fear. I might also include patients who are young and those who have kidney trouble and diabetes.

Obviously the problems of blood pressure are not all solved. No two cases are exactly alike. But more patients can be helped now than ever before in medical history.



"I've invented grass—what did you invent?"

THE HUGH DOWNS COLUMN

How to beat others to the draw

A FEW years ago, I was an honorary judge at a fast draw contest in Las Vegas. I was intrigued not only by the number of entrants but by the factors involved in winning in such competition—scientifically, they are more numerous than I had first thought.

Briefly, the contestants paired off and faced each other with blank-loaded pistols (mostly Colt Single Action Army revolvers, first patented in 1871) in a 'walk and draw' showdown. From opposite ends of a long ramp they walked toward each other and on a light signal they drew and fired. The first shot stopped the clock at so many hundredths of a second. Judges behind and to the side, determined whether the pistol was level and aimed reasonably at the opponent and a winner was determined on that basis.

The winning shots were within 22 to 26 hundredths of a second after the light. This is remarkable since the gun is heavy and reaction time must take at least 11 hundredths of a second.

The train of factors linking the events of the starting light and the timing of the finished shot contains the following elements:

Current applied to signal light (bulb). This is the event which triggers a series of happenings resulting in the stopping of the fast sweep hand of the precision clock at the firing of the shot.

Heating of the bulb filament. Requires less than one hundredth of a second—but since both contestants react on seeing the light it is not a competition factor.

Light traveling from signal to eyes of contestants. Each is a little over thirty feet from the light so this finite stretch of time can be counted negligible, amounting to one thirty-millionth of a second.

Reaction time of contestant (first appreciable factor in competition). This varies from one individual to the other and increases generally with age. Reaction time is the time between receiving a stimulus and starting any physical action as a result of that stimulus.

Drawing. This is an enormously complicated action, set off by a previously determined signal but played out as a patterned operation resulting from the conditioning of practice. Repetition and refinement, imprinting kinesthetic memory with responses open only enough for feedback to re-pattern toward the goals of speed and accuracy create a skill of the kind easily recruited by and intimately linked to volition. The gun must be grasped, the trigger depressed, the weapon pulled from its scabbard, started toward a horizontal position, and its hammer drawn full back, in that sequence and almost as one movement. (Curiously, the first thing a gunfighter did on getting hold of his single action sixshooter was to pull the trigger. This meant when the hammer was let go after being drawn back the gun would immediately fire. It by-passed the stage of being 'cocked.') Then, on 'feel' with that assurance that physical knowledge can give while by-passing the mentation that the gun is aimed in such a way that the bullet will be on target, the thumb must be slid off the spur of the hammer, allowing it to slam home. The speed of this whole action depends upon the strength of the shooter, his coordination (speed is limited not just by how fast he can move but by how fast he can bring all these motions together in the right way), the length of the gun barrel and the strength of the main spring. (Once the hammer is released, the strength and coordination of the shooter go out of play—a piece of tensed steel does the work of firing the shot by straightening itself. This can be a factor of over one hundredth of a second. The other factor, the mass of the hammer itself, can be counted negligible since the weight differences in the same model gun are small.)

Crucial walk

The distance of the shooter from the center of the walk. Since it is the sound of firing that stops the timer in increments of hundredths of a second, a distance of a few feet can be crucial. Suppose both shooters total 25/100 second in reaction time and level shooting. In other words both fire at the same exact moment. But suppose one has walked faster and is only eleven feet from the center (where the mikes

pick up the shots) while the other is twenty-two feet from the center. The closer will register 1/100th second sooner than his adversary. Since sound travels 1100 ft/sec. the man eleven feet away, if his gun fires in 25/100 sec. will register 26/100 on the timer, where the fellow twenty-two feet away will register 27/100 sec. So the *speed of walking* in a walk-and-draw contest is a factor in competition. It's a factor two ways, since faster walking increases the likelihood of getting a poor grip on the gun.

Slow-draw Downs

After the contest (won by a 22-year-old millwright from California in 21 hundredths of a second) I tried my hand at it. I found I could not get any accuracy in under one second, but most important my reaction time was longer than the champion's whole shot! I measured this by holding the gun cocked and level and firing when I saw the light. The only added factors were the inertia of the hammer and the speed of sound (at most, each one hundredth of a second.) As near as I could measure, my true reaction time averaged about 22 hundredths of a second. Once I got 19 hundredths. The champ's was 11 hundredths. Sammy Davis, Jr. is said to have measured 11 hundredths! He must have been even faster when he was twenty-two.

On the last try, as a joke, I decided to fire just *before* the light lit. And a curious thing happened. The light came on as I fired and the timer stopped after registering *one one-hundredth* of a second! Obviously I fired before I saw the light. But I was twenty feet from the mike, so what happened was as follows:

I pulled the trigger. A split second later the switch was closed and the light lit up. The hammer fell and the sound waves started to the mikes. Before the *sound* of my shot traversed that twenty feet the timer ran off just over 1/100th and stopped. Nobody has done that since to my knowledge. I gathered an admiring crowd and did not explain. After all, Wyatt Earp must have won at least *one* in the same lucky way.

"Listen! I think the wind has died down."

PLEASE EXPLAIN

The oldest light in the universe may be reaching us from quasars like 3C 273. The trip may take billions of light years.

Is the speed of light "ultimate"?

Please tell me why modern theory states that matter cannot travel faster than the speed of light.

Energy added to a body can affect it in a number of ways. If a hammer strikes a nail in mid-air, the nail goes flying off, gaining kinetic energy, or, in other words, energy of motion. If a hammer strikes a nail embedded in hard wood, so that the nail can't move, the nail still gains energy—but in the form of heat.

Albert Einstein, in his theory of relativity, showed that mass could be viewed as a form of energy (and the invention of the atom bomb certainly proved him correct). If energy is added to a body, that energy may therefore appear in the form of mass, as well as in other forms.

Under ordinary conditions, the gain of energy in the form of mass is so incomprehensibly tiny that no one could ever measure it. It was only in the twentieth century, when subatomic particles were observed to move at speeds of tens of thousands of miles per second, that examples of mass-increase were found that were large enough to be

detectable. A body moving at 160,000 miles a second relative to ourselves would be measured by us as having twice as much mass as when it was at rest relative to ourselves.

If energy is added to any freely moving body, that energy can enter the body in one of two ways: 1) as kinetic energy, so that its speed of motion increases, and 2) as mass, so that it becomes "heavier." The division between these two forms of energy gain, as measured by ourselves, depends upon the speed of the body to begin with, again as measured by ourselves.

Energy becomes mass

If the body is going at ordinary velocities, virtually all the added energy enters the body as kinetic energy, and the body moves faster and faster with hardly any change in mass.

As the speed of the moving body increases (and as we imagine additional energy constantly being pumped into it) less and less of the energy enters as kinetic energy and more and more as mass. We note that, though the body is still moving faster and faster, its rate of gaining speed is falling off. Instead, we note that it is becoming slightly more massive.

As its speed increases still further and gets fairly close to the 186,282 miles per second that is the speed of light in a vacuum, almost all the added energy enters as mass. In other words, the speed of motion of the body increases very slowly, but now it is the mass that is moving upward by leaps and bounds. By the time the speed of light is reached, *all* the added energy is appearing as additional mass.

The body *cannot* go faster than the speed of light because to make it do so one must impart additional energy to it and, at the speed of light, all that additional energy, however great, will merely be converted into additional mass, and the body will not increase its speed one iota.

Nor is this "just theory." Scientists have been carefully observing speeding subatomic particles for years. Cosmic ray particles exist with unimaginably high energy contents, yet though their mass climbs high indeed, their speeds never quite reach that of light in a vacuum. The mass and speed of subatomic particles work out to just what the theory of relativity predicts and the speed of light is a maximum speed as a matter of observed fact and is *not* merely speculation. —*Isaac Asimov*

What is an itch?

The skin contains the ends of sensory nerves. Any subtle irritation of these nerve endings can cause itching. It may be due to a mosquito bite, a chemical irritant, an allergy, dryness of the skin, a disease, or it may be a psychosomatic case in which the emotions are in control. Scratching tends to relieve the irritation temporarily.—*A.J.S.*

How many states of matter are there?

Many, say Westinghouse Research Laboratory scientists, Milton Gottlieb, Max Garbuny and Werner Emmerich, in their book *Seven States of Matter* (Walker, 1966). The Westinghouse team notes that of the immense quantity of matter in the universe, only a tiny fraction exists in the form of solids, liquids and gases. Beyond these three states, familiar in everyday life, there are many others in which matter exhibits physical properties vastly different from those normally encountered. Most stellar matter is in the plasma state, much of it at such high temperatures that it represents an environment of intense thermonuclear reactions. At the extremes of collision energy, new types of matter are encountered—splinters of the nucleus at one end, and the world of superfluids at the other, at temperatures within fractions of a degree of absolute zero. Under these conditions, matter may exhibit strange characteristics.

Even under normal conditions, the Westinghouse scientists note, there are states of matter not only hard to classify, but possessing unique and little known properties —quickclay, monatomic films and liquid crystals.

Address your questions to Please Explain, Science Digest, 1775 Broadway, New York, New York, 10019.

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A noted publisher in Chicago reports a simple technique of everyday conversation which can pay you real dividends in social and business advancement and works like magic to give you poise, self-confidence and greater popularity.

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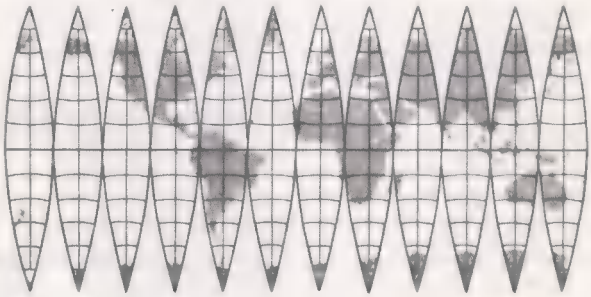
QUIZ



Making the earth flat

by John and Molly Daugherty

FLAT maps of the curved surface of the earth distort one or more of the properties a map needs to show—shape, area, distance and direction.

There are countless projections of curved surfaces to make maps flat. In general, these are (1) the geometric transfer to another surface like a cylinder or cone, tangent to some part of the globe, and then cut and unrolled to make a flat map and (2) the direct mathematical transfer to a plane of the directions and distances among points on a sphere.

What do you know about maps and their interpretation?

1. The map projection on which Greenland looks larger than South America is
   a. Simple conic
   b. Equatorial Mercator
   c. Polar stereographic
2. A conformal map is one that
   a. Shows the true shape of small parts of the earth
   b. Shows area in scale over all the map
   c. Has a constant-distance scale over all the map from all points
3. The oldest maps in existence date from about
   a. 4,900—5,300 B.C.
   b. 2,300—3,800 B.C.
   c. 1,000—1,234 A.D.
4. The type of projection in which all great circles are shown as straight lines is the
   a. Mercator
   b. Equal-area
   c. Gnomonic
5. When maps use color, the conventional color of hysography (relief features such as mountains) is
   a. Green
   b. Blue
   c. Brown
6. When the earth turns 1° on its axis, the number of miles it turns at latitude 45° on the surface compared with latitude 0° at the Equator is
   a. The same
   b. Fewer than at the Equator
   c. More than at the Equator
7. The United States Geological Survey began making topographical maps in 1882. A few years before World

War II, the proportion of our country that had been topographically surveyed was

a. Less than 50 percent
b. About 75 percent
c. Over 97 percent

8. The map best suited to ocean navigation is

a. Polar (conic)
b. Stereographic
c. Equatorial Mercator

9. On the conic or gnomonic projection, a map looks like an open fan upside down. The ribs are the meridians, and the concentric arcs, concave toward the point, are the lines of parallel (see figure). On such a map, a city X is

a. Due west of Y
b. Northwest of Y
c. North of Y

10. A map scale measures distance. One method of showing scale is the use of a fraction like $\frac{1}{10{,}000}$, often written 1:10,000. The fraction method permits the use of any units of measurement, e.g., 1 inch = 10,000 inches, meaning that 1 inch on the map equals 10,000 inches on the earth. The scale adopted by all nations for the International Maps of the World is

a. 1:250,000
b. 1:1,000,000
c. 1:100,000

Answers:

1—b Equatorial Mercator. Greenland appears about nine times larger. Likewise, Australia appears smaller than Greenland. The Mercator grid of rectangles for latitude and longitude stretches in both dimensions as latitudes become farther and farther from the Equator. While shapes are approximately retained, areas increase rapidly in *appearance*. Scales true at the Equator are greater as one approaches the high latitudes of the Arctic.

2—a Shows the true shape of small parts of the earth. A map is called conformal even though it does not completely maintain shape over a large area, such as a continent. A map cannot be equal-area and conformal at the same time, for shape and other properties would suffer. Only a globe can have a constant-distance scale over all the map from all points.

3—b One authority cites the earliest map extant as an Assyrian clay tablet of 3,800 B.C. showing part of northern Mesopotamia. Another authority says the oldest in existence is a clay tablet dug up in Iraq showing the location of a rich man's estate about 2,300 B.C. Both of these are older than the oldest existing papyrus map, which shows a Nubian gold mine and is in the Turin Museum.

Of course, prehistoric men in nomadic tribes made rudimentary maps, and primitive people today make maps showing waves and islands with shells and palm leaves.

4—c Gnomonic. On the gnomonic map, all great circles become straight lines, and all plotted bearings give the shortest distance between two points. Near the boundaries of the map, however, shapes, areas and distances are greatly distorted. The gnomonic is a projection from the center of the earth to a plane which (if it is tangent to the Equator) shows all the parallels as arcs except the Equator itself. All the meridians, great circles on the globe, are straight lines on the map.

5—c Brown. Water (hydrography feature) is blue; vegetation, green; and culture or man-made features,

black and red usually. Mermaids, seahorses, whales, and mythological figures representing the four winds enhance many old maps that were made by hand before woodcuts and copper engravings.

6—b Fewer than at the Equator. At 45° north or south latitude, the number of miles in turning 1° is 48.99. At the Equator, 1° equals 69.17 miles.

The Equator is a great circle, but parallels of latitude are smaller circles, and the circumference of these circles is less than that of the equatorial circle. At both the Equator and any other parallel, a given point makes a complete revolution in the same time, so the miles per degree is less at 45°.

7—a Less than 50 percent. After World War II, aerial photography and electronic surveying equipment greatly accelerated cartography. Today every civilized country publishes maps, which are usually made by the army. The United States Army Map Service makes air navigation maps of the world.

8—c Equatorial Mercator. The Mercator map with its rectangular grid of parallels and meridians is familiar to most people. Its unique property is that if a straight line is drawn between two locations, the line intersects at a constant angle all meridians it crosses. This permits navigators to set their compasses in the direction of the line and stay on the course. The Mercator map is like a cylindrical projection but is mathematically modified.

9—a Due west of Y. Location on a map is determined by a system of longitude and latitude lines. X and Y lie on the same latitude. Therefore on the globe, X is due west of Y. Only the appearance of the projection makes it seem otherwise.

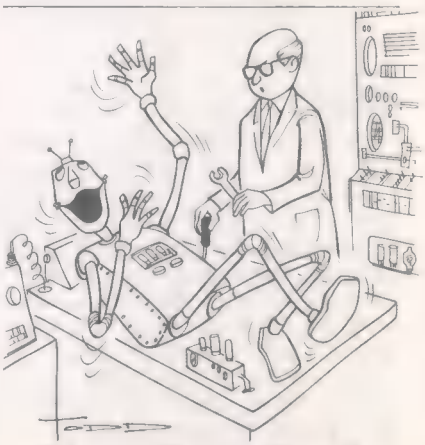
10—b 1:1,000,000. Because you are probably so accustomed to English units of measurements, the fraction is more meaningful when changed to 15.78 miles an inch. You obtain this scale by dividing 1,000,000 by 63,360—the number of inches in one mile.

Score Yourself:

8—10 right—You must know about index maps—maps to find maps!

4— 7 right—You're probably a good road-map reader, anyway.

0— 3 right—At least you know the world isn't flat, though the map of the world is!



"Oh, stop it, I'm not tickling you!"

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LETTERS

TV tubes

The article "Tomorrow's Color TV" by Walter G. Salm (Aug. '66) has recently come to my attention. This article which discusses future prospects of color TV has, I believe, made a significant contribution to the better understanding of present and future color TV systems.

I must, however, take strong issue with the statement concerning the source of supply for the glass bulbs for color TV tubes. The Consumer and Technical Products Division of Owens-Illinois, Inc. has been an important supplier of color TV bulbs since the onset of rapid growth in color TV in the United States.

We are responsible for the introduction and remain the only supplier of rectangular color TV bulbs used in the manufacture of the 23" rectangular color set first put on the market in 1964 by Motorola, Inc. In September, 1965, we introduced the 21" rectangular color bulb which is now appearing in the newest lines of color TV sets. In the interim, we have also been a supplier of the "old standby" of the color TV field, namely, the 21" round bulb. We therefore feel as a substantial supplier and innovator in the field of color TV that the information given in the article was indeed erroneous.

B. L. Steierman
OWENS-ILLINOIS
Manager, New Products
Toledo, Ohio

Telltale shoes

Since I can remember, I have been a science fiction and real science fan, and I have read and do read about all that is available on the market in these fields.

I have read your August '66 issue and found that the articles were most interesting and very plausible—that is until I came upon "The Chair That Takes Your Pulse." The picture caught my eye immediately. I am a nurse and have been for more years than I care to admit. And I have yet to dress as the gal in your picture does. I do not think that dress shoes with a uniform are the height of fashion for any nurse, in any capacity, even if she is being used in a demonstration.

Please do not dress up models in a nurse's uniform and cap and try to tell the public that this is a nurse. We are having a tough enough time as every waitress, hair stylist, etc. is wearing white and we are not happy at the idea of people using the uniform and cap as representative of nurses.

AGNES S. KHESMANN
Pueblo, Colo.

Fasting

The article by Dr. Joseph Wassersug, "If You Can't Lose Weight" (July '66) was most instructive. He remarks on the experiments of some researchers who subjected several patients to a program of total starvation, allowing them only water and low caloried beverages. In some cases he notes, the kidneys inexplicably failed to function and deadly poisons

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accumulated in the blood, causing death in a few instances.

I would like to comment on this. During a fast, the large intestine must be cleaned out twice daily. If this is not done, kidney trouble and toxemia are quite likely to occur. Dr. Wassersug does not say if this was done in the experiments referred to. Also, if the kidneys were organically unsound at the outset, it is possible that the 'total starvation' they were subjected to would have some bad effects.

I feel impelled to point out that fasting has a real value if properly conducted under the supervision of an expert.

M. SAPIRE
East London,
South Africa

A request

Some time ago, an American friend sent me a copy of the April, 1960, issue of your excellent magazine. After reading it, we wished all our schools had this magazine in their libraries, but the fact is, we are only poor missionaries, with no U.S. currency to pay for subscriptions.

If there are extra copies no longer wanted by subscribers, may we have the pleasure of receiving them?

If we stick only to what we read in our textbooks, we would soon be outdated. We need a digest like the one you are publishing in order to keep up with this changing world.

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Weather control

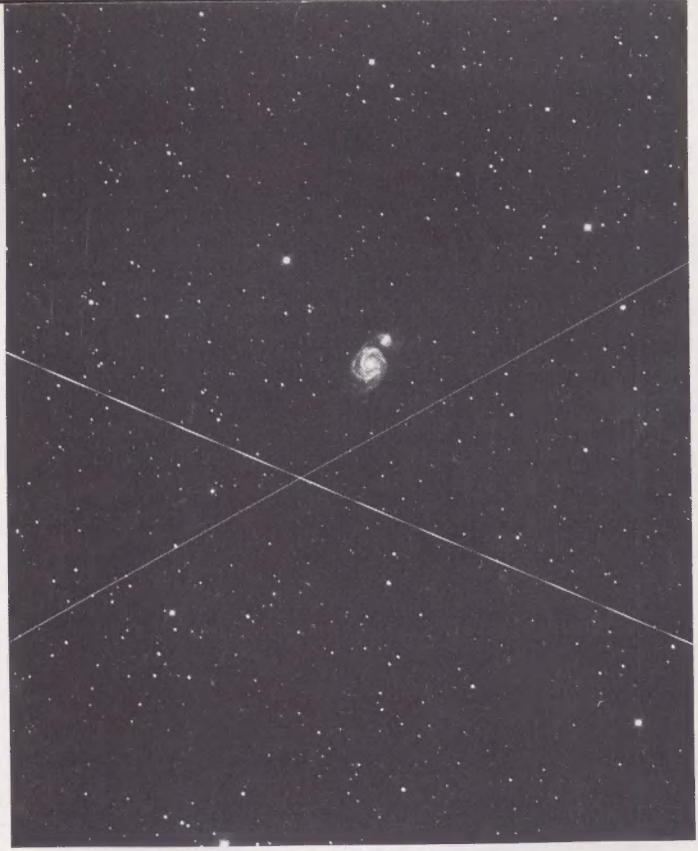
Your article "Can We Change the Weather?" by Bruce Frisch (Sept. '66), was recommended to me by friends because I am a retired forecaster and meteorologist of the U.S. Weather Bureau and was, for some 25 years, in charge of the progressive weather station in Cleveland. Many phases of the control of weather came before me for action and for consultation and study. You deserve compliments on printing this article which was stimulating and useful. However, I would say that the author misses the same boat other writers on the subject have missed.

Whatever is done in modifying, controlling or fending off any weather action, the cost will obviously be tremendous. But the main squeeze will be where and when to modify. A majority, or an industry may have a reasonable wish to have rain; a minority may not. Some want rain on Tuesday, others on Thursday, some want none at all. It can be stated positively that the main problem of making weather is what to make, where and when. Your article skips this phase and spends too much time on the mere mechanics.

The reluctance of the head men, in the seeding of hurricanes, to touch them unless they are far out to sea (as with Faith in August) is omitted. The recent ruling by ESSA on modification issues a mandate that permission be had from Federal authorities.

One other feature is that better forecasts will have to precede permission. Forecasts are not that good now. We need them.

C. G. ANDRUS
Due West, S. C.



Crossroads in the sky

On February 20, 1966, Hans Vehrenberg, a Düsseldorf businessman and one of Germany's leading amateur astronomers, set up his camera for a 75-minute exposure of the galaxy M51. While the photograph was being taken, two artificial satellites crossed the camera's field. One left a uniform trail, but the other trail varied in brightness as the satellite tumbled. The result was the unique sky panorama shown above. Vehrenberg rose to prominence in the field of astronomical photography recently with the publication of his *Photographic Star Atlas*. For it, he charted the northern heavens first, from his well-equipped private observatory at Falkau in the Black Forest. Then in 1965, he spent five months at the Boyden Observatory in South Africa, photographing the southern sky. The ensuing atlas of the celestial panorama covers all the stars in the sky to magnitude 13.

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